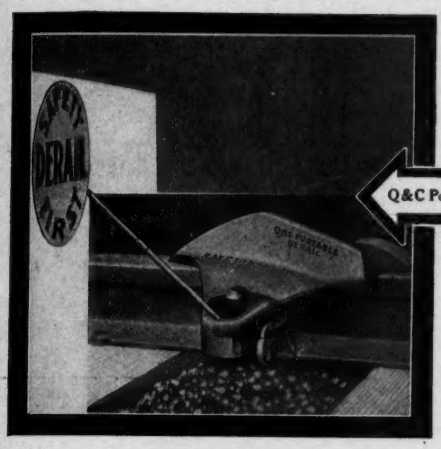
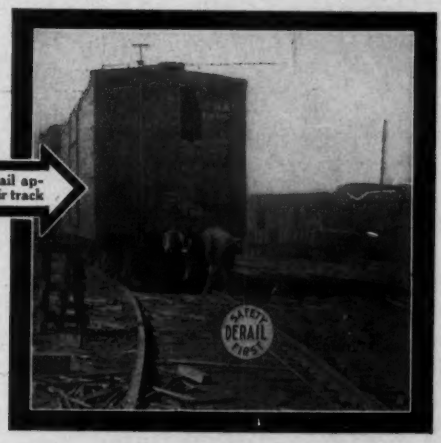
Railway Maintenance Engineer

Volume 13 CHICAGO: Transportation Building NEW YORK: Woolworth Building FEBRUARY, 1917 CLEVELAND: Citizens' Building WASHINGTON: Home Life Building Number 2

Q & C Derailers



Q&C Portable Derail

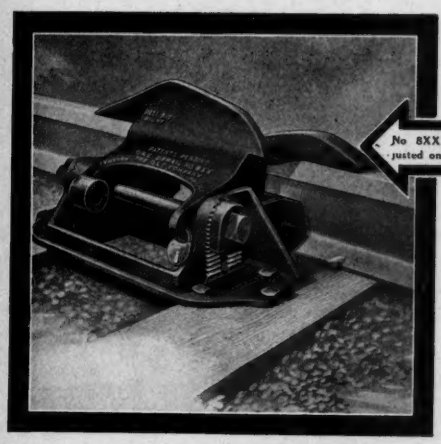


Portable Derail applied on repair track

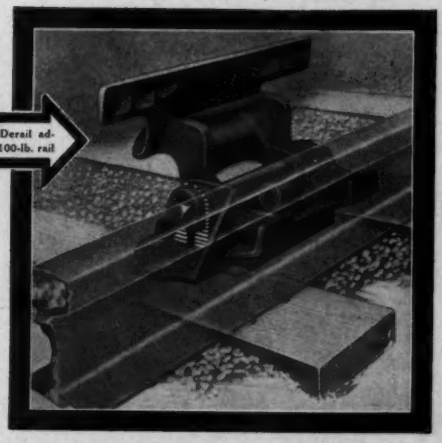
The special feature of these derailers is that they are adjustable to different sizes of rails

They overcome defects commonly found in the switch point derail and are easier to care for.

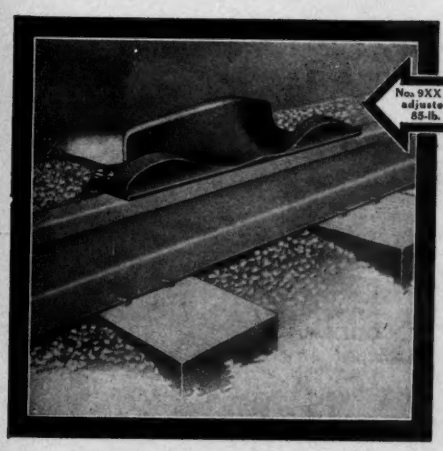
Another feature is that the price will appeal to you.



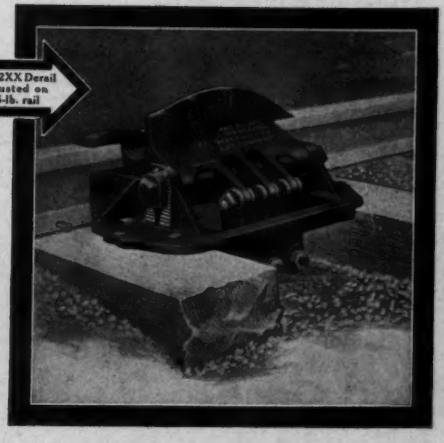
No 8XX Derail adjusted on 100-lb rail



No 8XX Derail adjusted on 100-lb. rail



No. 9XX Derail adjusted on 85-lb. rail



No. 12XX Derail adjusted on 95-lb. rail

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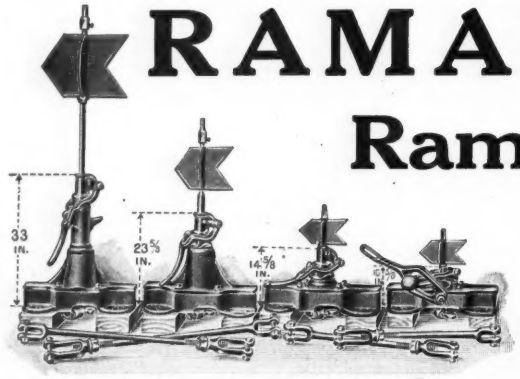

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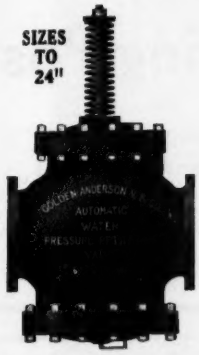

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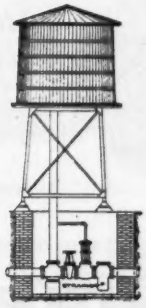

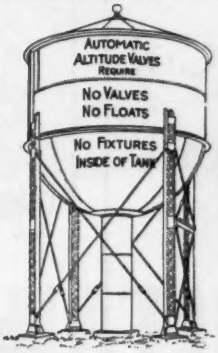

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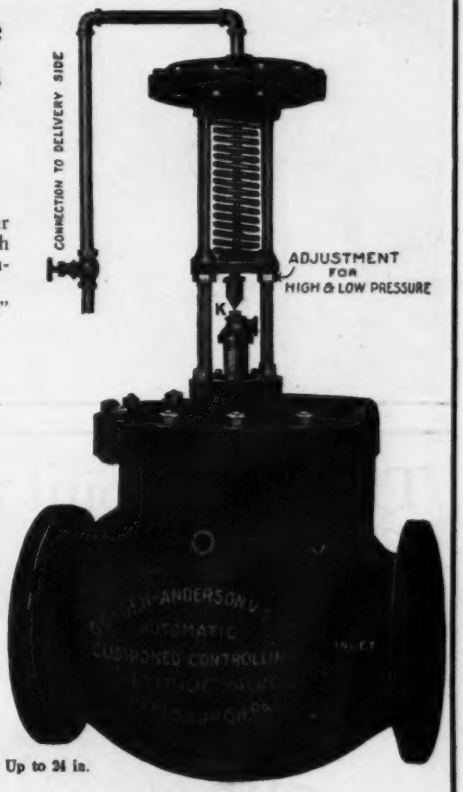

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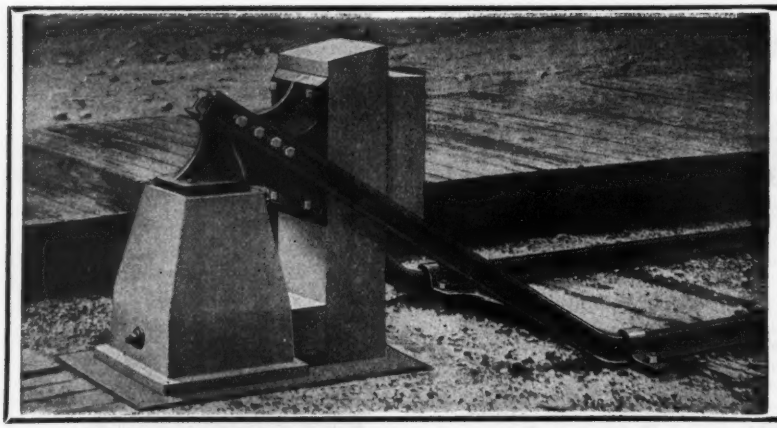
Front View

Side View



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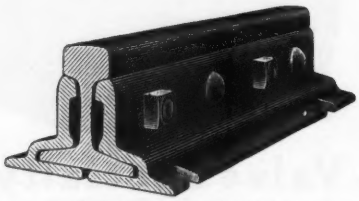

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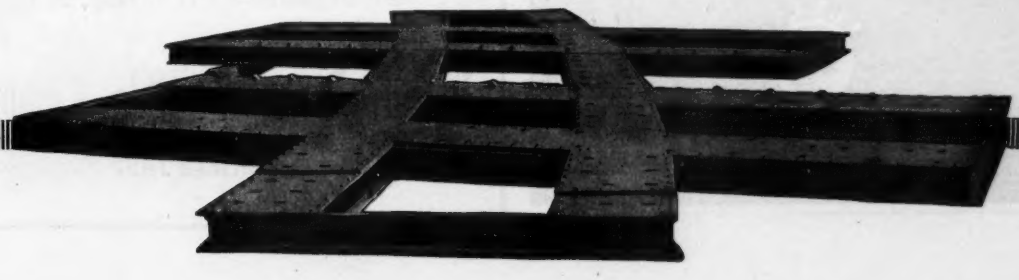

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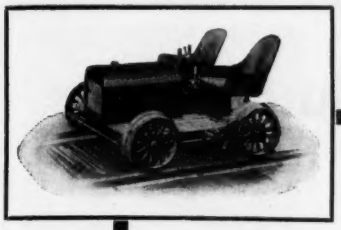

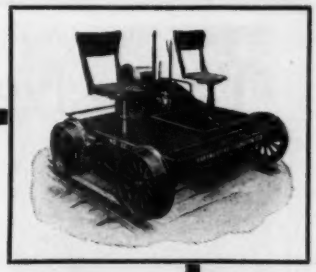

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Have helped hundreds of railroads in North and South America finish Spring track work on schedule time.

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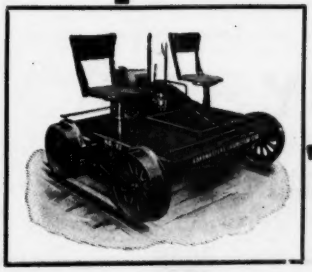
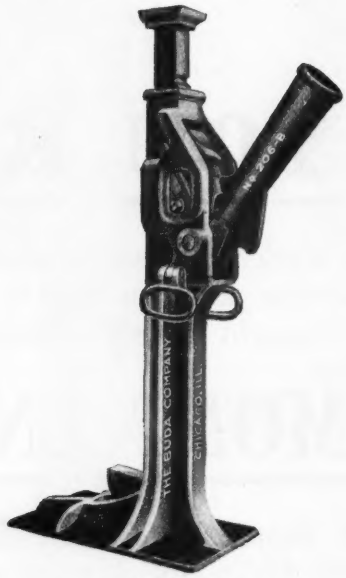


Three New and Improved Buda Jacks

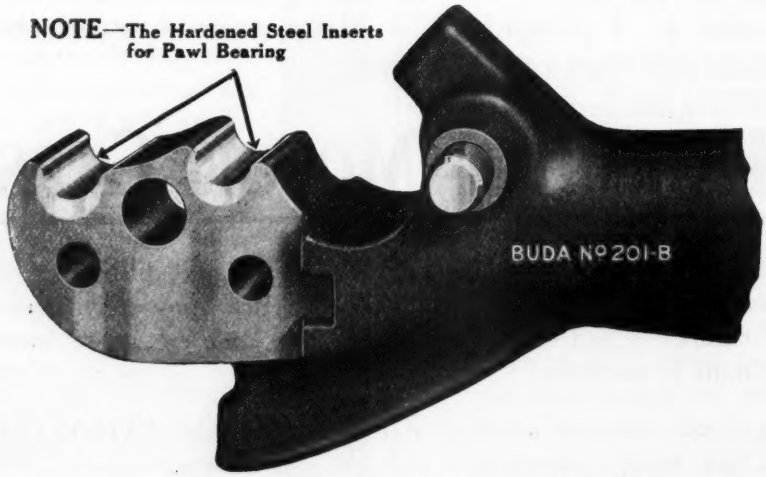
Buda No. 201-B



Buda No. 206-B

Buda No. 219-B

NOTE—The Hardened Steel Inserts for Pawl Bearing



Improved socket lever as used in Buda Ratchet Jacks Nos. 201-B and 206-B

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THE BUDA COMPANY

New York **CHICAGO** St. Louis

A CEMENT-GUN for Every Division

HOW THE Cement-Gun Meets Railroad Needs

How Savings and Safety are Secured by Its Use

The Pennsylvania Railroad
Needed to preserve the ferry bridge at Cortland Street, New York.

The Cement-Gun
was used and steel which was rapidly going to pieces was saved.

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Needed to save their tracks from danger of falling slabs of rock.

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Sealed the fissures in those cuts and prevented infiltration and resulting frost-heavings.

The P. & L. E. R. R.
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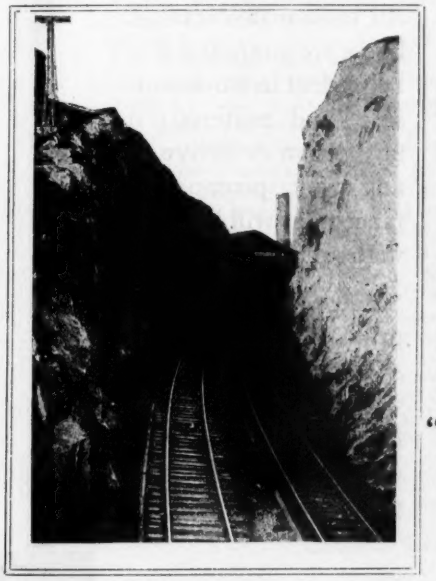
The Cement-Gun
did it at less cost than forms would have been, and saved 40 per cent in dead load over concrete.

The New York Central
Wanted to fireproof the girders and columns at Grand Central Station after the floor slab was in use.

The Cement-Gun
five of them, were used and one million square feet covered at less than what forms would have cost.

The Atlantic City & Shore R.R.
Needed to preserve the pivot-pier of their bridge over "The Inlet" at Atlantic City.

The Cement-Gun
Saved them from tearing down this structure.



THE CEMENT-GUN is the field gun of General Satisfaction and Saving for Railroad Work and its adoption has everywhere resulted in marked decrease in maintenance cost.

The Cement-Gun can be purchased outright from us, and used by any one, as it is not a restricted article.

Send for "The Book of Deeds," remember "deeds speak louder than words," and that is why this book has been prepared, this book of deeds performed, savings and safety secured, by use of the Cement-Gun. Send for this book and learn why your road needs

"A Cement-Gun For Every Division"

to hit high costs and bring them down and secure the safety of "Gunite," the Cement-Gun product which defies the elements. The Cement-Gun is exhibited at the Chicago Cement-Show. Don't fail to see it.

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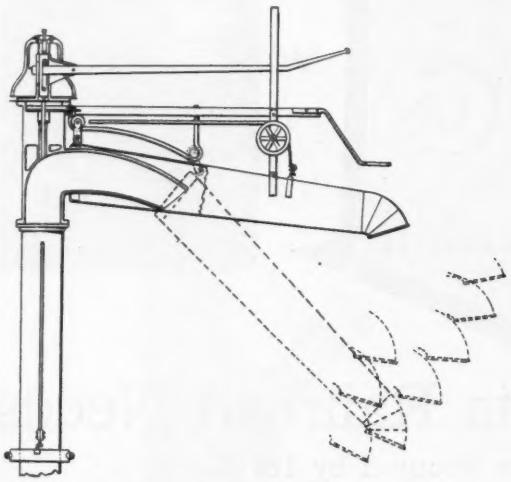

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Non-freezable telescopic joint over the discharge nozzle of the tee—a joint that is entirely open, without packing or working apart, yet does not waste a bit of water.

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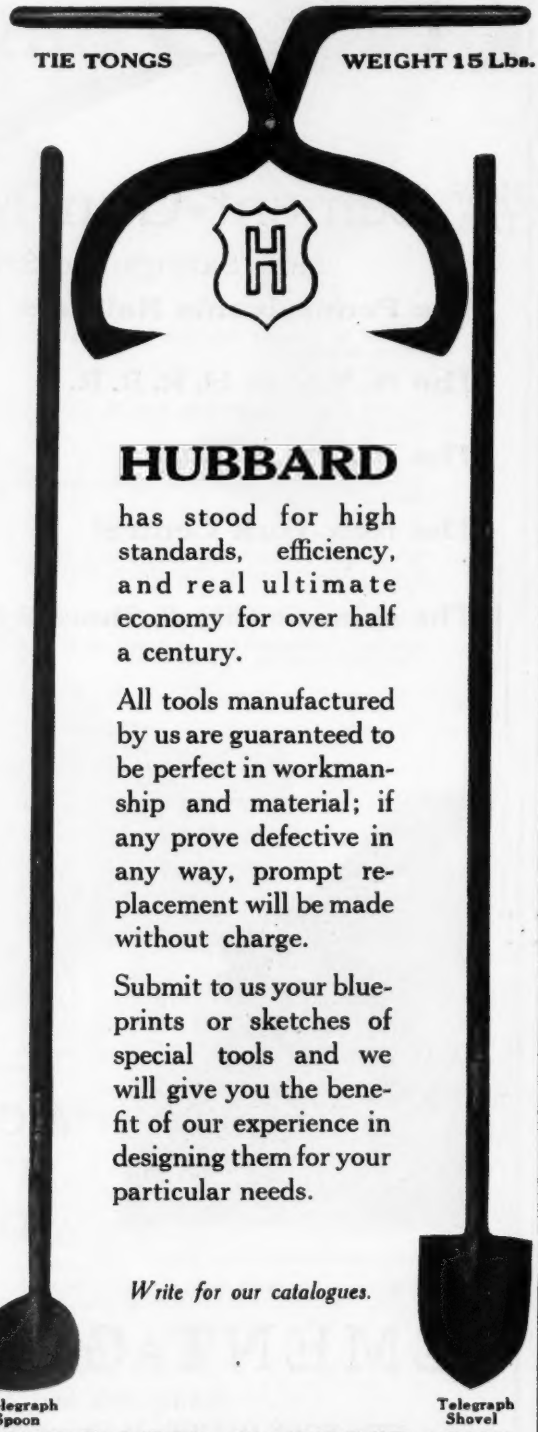
Shovels *and* Track Tools



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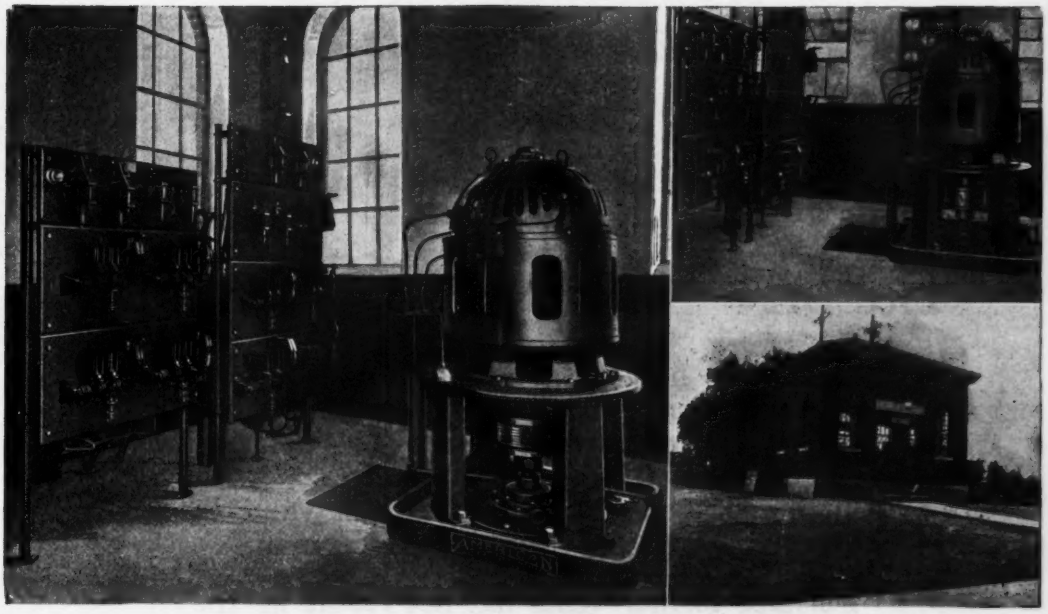

The Tale of a Contemporary Who Tried to Show Us Up in Our Home Town

Aurora is growing and requires more water. About two years ago it was decided to supplement the water supply with three unit wells located at widely separated points about the city. In all three of these wells "American" combination deep well turbine with booster centrifugal pumps, mounted on the same shaft at the surface, will be installed. Two of these installations have been in operation over a year and the third is under construction.

This tale relates to what is known as the River Street well, exterior and interior views of the pumping station of which are shown in the above illustrations.

This well is cased with 18-in. O. D. casing to a depth of 300 ft., below which it is entirely in rock and is 15 in. in diameter to a total depth of 2,262 ft. During the time the well was being drilled the City of Aurora gave The American Well Works an order for a combination 17-in. type KNMD deep well turbine and booster pump direct-connected to vertical type motor to be installed in this well.

The order called for a pump designed to deliver 1,000 g.p.m. from a point 100 ft. below the surface and maintain a pressure of 72 lb. at the surface, it being assumed that the well would deliver this quantity of water at this depth. When completed the well at 100 ft. depth had a much smaller delivery than expected and the pump was installed to deliver water from 125 ft. below the surface, from which point the delivery was 640 g.p.m.

A contemporary learning that this pump was operating under much more difficult conditions than those for which it was designed concluded that it would be an excellent opportunity to show us up in our home town by proving that our pump maintained a smaller efficiency than our guarantee.

C. W. Pendell, consulting hydraulical engineer, Chicago, was employed to make the test. The result of this test showed that the two pumps operating in series, pumping from 25 feet greater depth than that for which they were designed and even at this depth operating under conditions in which the pumps were delivering 360 g.p.m. less than the quantity for which they were designed, were maintaining a combined pump efficiency of 63.2 per cent, which was 3.2 per cent per 1,000 gallons more than our guarantee.

As a means of obtaining a greater quantity of water from this well the City of Aurora employed us to redesign a combination deep well turbine with booster pump at surface to pump from 225 feet below the surface. When this installation was completed Dabuey H. Maury, consulting hydraulical engineer, Chicago, was employed to make the test. The result of this test showed that the two pumps operating in series with the turbine pumping from 225 feet below the surface were delivering 896 g.p.m. against a total head of 426.6 ft. and were maintaining a combined pump efficiency of 70.4 per cent.

And now if anyone else among the brethren has a suspicion that these pumps might not be producing the combined efficiency claimed for them, the pumps are in operation now and perhaps will be any time your engineer is ready for the test.

Catalog 132 describes these pumps. Write for it.

The American Well Works

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Chicago Office: First National Bank Building

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Philadelphia, Pa.	Lincoln, Neb.	Montreal, Can.	Kansas City, Mo.
Pittsburgh, Pa.	Birmingham, Ala.	Chatham, Ont., Can.	Joplin, Mo.
St. Paul, Minn.	Artesia, N. Mex.	Edmonton, Alta.	St. Louis, Mo.
San Francisco, Cal.		Salt Lake City, Utah	Calgary, Alta.

"Bringing Home The Bacon"

"Bringing home the bacon," or, in other words, returning home from your visit to the ***Exhibition of Maintenance of Way Appliances in Chicago, March 19-22,*** with additional concrete information of value to you as a progressive maintenance man.

Perhaps former visits did not result in the systematic and thorough study you had hoped, nor give the net result in additional information you intended to secure.

This year, however, it will be different; you go determined to digest what you see, to make it form a real addition to your own experience; in short, "to bring home the bacon."

That being the case, you will make your trip of the greatest possible value to you. Then why not record what you learned at the exhibit and secure another piece of the bacon in the way of $50?

How? See editorial announcement in this issue explaining how

You May Earn $50

Simmons-Boardman Publishing Company

NEW YORK CHICAGO CLEVELAND WASHINGTON

Railway Maintenance Engineer

Volume 13 February, 1917 Number 2

(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age Gazette* and *Railway Engineering and Maintenance of Way.*)

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Subscription price, including the twelve regular monthly issues of the *Railway Maintenance Engineer* and the four daily issues of the *Railway Age Gazette*, published in connection with the annual convention of the American Railway Engineering Association: United States, Canada and Mexico, $1.00; foreign countries (excepting daily editions), $2.00.

WE GUARANTEE that of this issue 7,300 copies were printed; that of these 7,300 copies, 6,500 were mailed to regular paid subscribers, 103 were mailed to advertisers, exchanges and correspondents, and 697 were provided for new subscribers, copies lost in the mails and office use.

The *Railway Maintenance Engineer* has applied for membership in the Audit Bureau of Circulations.

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One becomes accustomed to seeing large figures in the railway industry. At the same time the magnitude of some of the routine expenditures by the maintenance of way department may not be generally realized. For instance, the total expenditures of this department chargeable to operation and to additions and betterments for the year just closed were at the rate of over $3,000,000 per working day, almost half of which was for materials. Over 4,500,000 tons of rails were ordered in 1916, involving an expenditure of over $150,000,000, while the rail inquiry of the Pennsylvania recently withdrawn contemplated an expenditure of over $8,000,000 for this one road alone. During the last month the Southern Pacific has ordered 94,000 kegs of spikes, costing over $700,000. These are typical of a wide variety of purchases made by this department on all railways, the magnitude of which are not generally realized.

Magnitude of Maintenance Expenditures

Conservation of materials is obviously one of the prime duties of the supervisor of bridges and buildings. This applies not only to a supervision of workmanship that will insure the least waste and the longest possible life of the materials supplied, but also requires the exercise of ingenuity in devising methods by which the usable parts released from old structures can be put to new uses. Owing to the wide variety of materials used in bridge and building work at the present time oportunity is afforded for the expression of a wealth of ideas. With a view to drawing out suggestions along this line a contest for papers on the Reclamation of Bridge and Building Materials was announced in the *Railway Maintenance Engineer* for January. Eight papers have been received and are now in the hands of the judges. The result of this contest will be announced in the next issue, when the prize winning papers will be published.

The Reuse of Old Materials

The report presented by the Committee on Specifications for the Purchase and Preservation of Treatable Timber before the convention of the American Wood Preservers' Association in New York last week, reflected the increasing realization of the importance of the adoption of reasonable precautions to protect timber from the attacks of decay. Although wood has been the common construction material for centuries, it is only within comparatively recent years that attention has been given to the protection and prevention of decay. Even today protective measures are commonly considered as applicable only to the larger storage yards at system headquarters or at timber treating plants. Largely for this reason conditions tending to produce decay are permitted to exist at smaller yards which in the aggregate contain perhaps as much timber as the central points and in which the possibilities of loss are equally great. Whether awaiting treatment or use untreated, it is time and money well spent to remove decay-breeding conditions. The slogan in one large Southern lumber yard, "Help Keep the Yard Clean," deserves emphasis in the smaller as well as the large lumber yard. The local supervisor of

Decay in Small Lumber Yards

bridges and buildings and the division storekeeper can do much to protect the timber in their charge from unnecessary exposure to attacks of decay if they only realize the importance of such work.

MODERN ERECTION METHODS

THE replacing of four river bridge spans having a total length of 1,000 ft. by four new ones, through the agency of a lateral shift during a temporary interruption to train service, as described on another page of this issue, is an excellent demonstration of the high degree of development attained in modern bridge erection methods to meet the demand for minimum interferences with train service on dense traffic lines. Construction feats of this kind require painstaking care in the preparation of the most minute details of the program of the work, for serious delays and even disaster may result from the oversight of some seemingly unimportant feature. The contingencies which cannot be foreseen are usually encountered to a sufficient degree to tax the ability and resourcefulness of those in charge to the utmost. This was illustrated in the case in question by the loss of time brought about through the entirely unlooked-for foaming of the boiler water of two of the hoisting engines used to move the bridge. Owing to the excellent organization and perfection of the plans it was possible to carry out the necessary modification in the procedure which this occurrence necessitated without causing the least confusion. While the magnitude of the undertaking on the Omaha bridge demanded a degree of preparation and perfection of organization not necessary on a smaller project, the conduct of the work ought to serve as a valuable example to the erector. The use of flag signals to control the movement was particularly efficient, with the result that the movement of the spans was carried on with an entire absence of the hurrying about and shouting of orders which have been all too common in the past in work of this kind. The erection superintendent who depends more on his native resourcefulness than on the preparation of definitely laid plans is at a decided disadvantage in the conduct of exacting erection procedures.

REGULATION INVESTIGATION EXTENDED

BOTH houses of Congress have passed and the President has signed the joint resolution extending to December 3, 1917, the time for a report by the Newlands Joint Committee on Interstate Commerce as a result of its investigation into the questions of government railroad and public utility regulation and control and the question of government ownership. For a short time it appeared as if Congress was going to shelve the entire investigation, on which only a beginning has been made so far, on account of opposition in the House. The resolution for the extension of time was passed on the day after the committee had expired in accordance with the terms of the original resolution, under pressure from President Wilson, who was responsible for the initiation of the inquiry. While some of the opposition in the House was due to those who prefer to pass anti-railroad legislation without investigation, some of it was not intended to be unfriendly to the railroads, but was based on the fact that the scope of the inquiry included the subject of government ownership. The hearings before the committee have been postponed until after the close of the present session of Congress on March 3, because of the pressure of other business on the members of the committee, but will undoubtedly be resumed soon after that time. The committee will then hear representatives of various business and civic associations who have already gone on record as recognizing the need for more co-ordination in our system of railway regulation, from bankers, economists and publicists, and from practical railway officers who will testify in detail regarding the defects in the present dual system of regulation and their proposed remedies, which have already been outlined before the committee by Alfred P. Thom, counsel for the Railway Executives' Advisory Committee. It seems impossible that the committee should fail to be impressed with the need for a radical change in the spirit of regulation from the policy of restrictiveness that has prevailed in the past to one of constructive helpfulness in the interest of the commercial welfare of the nation.

CONTEST ON APPLIANCE EXHIBIT

THE annual exhibit of the National Railway Appliances Association is the greatest display of maintenance of way and signal materials in the world. For this reason it is of pronounced educational value to men employed in these branches of railway operation, particularly to those removed from the larger railway centers, and, therefore, more or less out of touch with new developments. Perhaps because this exhibit is given each year, many railway men do not fully appreciate the opportunity it affords for study and comparison of the new and improved appliances of many types and kinds all gathered together under one roof.

In order to assist in making this exhibit of the greatest value to railway men, the *Railway Maintenance Engineer* and the "Railway Age Gazette" have united in conducting a competition on descriptions of the exhibit and offer a first prize of $50, a second prize of $25 and a third prize of $10 for the best discussions of the practical value to railway men of the exhibits of devices and materials used in the maintenance of way and structures and of the manner in which this display can be improved. These papers should be mailed to the editor of the *Railway Maintenance Engineer,* 608 South Dearborn street, Chicago, not later than April 9, 1917. The prizes will be awarded by three railway engineering or maintenance officers, whose names will be announced later.

The "Railway Age Gazette" and the "Railway Signal Engineer" will jointly conduct a second contest on that part of the exhibit relating to signal appliances. The *Railway Maintenance Engineer,* the "Railway Age Gazette" and the "Railway Signal Engineer" also jointly offer a single prize of $60 for the best paper covering the exhibit as a whole, with the understanding that no individual will be awarded more than one prize. Such papers may be sent to the editors of any of the three journals mentioned. Papers covering both the maintenance and signal exhibits will be considered for the combination prize, and those that fail to win it will still be eligible for consideration in the two main divisions of the contest. If an author does not specify in which contest his paper is entered, it will be placed in the group in which it seems best suited in the judgment of the editors. This prize will be awarded by a special board consisting of a railway executive officer, the chairman of the committee referred to above, and the chairman of the similar committee which will award the prizes in the signaling contests.

These contests are open to any one employed in railway service. Papers may be of any length not exceeding 2,500 words.

In making the award the judges will consider (1) the practical value of the information which the writers present, based upon studies of the exhibits and the extent to which the information will be of direct service to

those who have not attended the display; (2) the value of the suggestions offered to make the exhibit of greater benefit to railway men; (3) the clearness and conciseness with which they cover the exhibit. In preparing these papers the writer should deal with classes of devices or materials rather than the makes and manufacturers' names should be used only when necessary to make the meaning clear.

THE SEASON'S PROSPECTS

IN studying the prospects for the coming year from the standpoint of the maintenance of way department it is evident that it will be similar in many respects to the year recently closed. Therefore, a brief review of the experiences of the past season will aid in preparing for the next. The most prominent characteristic of 1916 was its marked activity. Following two years of reduced earnings and severe retrenchment, business improved rapidly late in 1915 and during 1916 so that money was available not only for the routine upkeep of the property but also for many of the improvements which had been deferred in previous years. This same condition of heavy traffic still continues and most roads are now planning even more ambitious programs of improvement work than a year ago.

Work had hardly been undertaken last year when complaints arose regarding a shortage of labor. This condition forced many lines to employ classes of men with which they were unfamiliar. Negroes were brought North in large numbers at wages far above those they had received previously in the South. As a result the southern roads were themselves forced to raise wages considerably above the rates previously paid. There was an equally distinct although not so large a movement of Mexicans east from the Southwest. These movements of labor will undoubtedly continue this year. Many more Negroes will move north and this will undoubtedly create a considerably more severe stringency in the South and force wages more nearly to the level of those paid on the northern roads. Because of the present unsettled conditions in Mexico and the difficulty of reaching the border from the interior it is doubtful if many more men can be secured from that source. Thus the present indications are that the shortage of men over this country will be even greater than last year, which in turn will result in the wage rate being at least maintained at the high level of 1916. It is also to be expected that there will be more or less serious labor disturbances.

Although a largely increased amount of attention was given to the housing and feeding of the men last year it is certain that the shortage of labor this year will lead to even greater efforts to provide improved camp equipment in an endeavor to hold men in the service. To many of the men employed in track work, comfortable living quarters are as much of an inducement as wages, and they seek employment on those roads which provide the best facilities in this respect.

Another handicap to maintenance of way work last year which will be evidenced to an increasing extent in 1917 is the increase in the cost of almost all materials and the further impossibility of securing early deliveries at any price. Open hearth rails are now quoted at $40 per ton as compared with $30 a year ago, and other materials have risen more or less directly in proportion, while deliveries on most iron and steel products ordered now cannot be secured until late in the fall and in many instances until after January 1, 1918.

Even with this handicap the railways have discounted the higher cost of conducting work and are preparing larger budgets than for any recent year.

LETTERS TO THE EDITOR

HELPING THE FOREMAN

TRENTON, MICH.

TO THE EDITOR:

I have noticed much discussion in the *Railway Maintenance Engineer* in regard to section laborers and foremen. Many railroads do not pay sufficient wages to attract young men into the track service as laborers, and the men know that the chance for promotion above a foreman's position is very rare, as many of the roadmasters are recruited from the engineering staff. Therefore, young men of to-day seek to enter other branches of railroading at better pay than received by the maintenance foreman, with less responsibility and a fair chance for promotion.

If railroads would adopt the apprenticeship system and pay a man according to his ability it would bring out good young men for the track department and enlist their best services. Nothing encourages a man more than to know that, if his ability to master the different important duties is demonstrated the company can give him advancement and he will strive to the utmost to please and to perform these duties to the complete satisfaction of his superiors.

Another subject worth serious consideration on the part of some railroads, especially at this time when it is almost impossible for a foreman to get section laborers, is the more general adoption of labor-saving equipment. Many things are manufactured which will help a foreman to do more and better work in maintaining heavy, high-speed track. A good motor car, for instance, will give a foreman one-half hour more actual work with his crew on his section per day.

The time has arrived when more consideration must be given to employing section foremen and laborers for the future. This is not a very hard task if the proper methods are adopted.

G. F. HUMES,
Section Foreman Michigan Central.

CONSIDER THE MEN WE HAVE

TEXAS.

TO THE EDITOR:

We see a number of letters in the railway publications regarding the shortage of section foremen. Most of the writers take a pessimistic view of the situation, and suggest various remedies, such as the apprentice system, a graduated rate of pay, an increase of pay for section foremen, etc. All of these are good ideas and no doubt will have a tendency to improve conditions eventually. But one thing I have noticed in going about over the country is that, notwithstanding the complaints regarding the scarcity of good foremen, every railroad of which I have any knowledge has made a vast improvement in track conditions in the past 25 years.

My experience has been that one cannot scare people very much by telling them of something that may happen. For instance, if a section foreman has his track up in first-class shape and tells me that he is afraid he will not be able to hold men enough to keep it that way I am probably not greatly worried over the matter and will probably think that he is climbing hills before he gets to them. In the same way the officers, in riding over the railroad, will notice the improvement being made from year to year and are not unduly impressed by the

troubles of the track department, and if too many complaints are made they may possibly think them symptoms of colic in the roadmaster.

I have been in railroad work many years and, like all old timers, sometimes think of the good old days when Kelly and Burk and Shea were familiar names on our payrolls, but I recall that those were not times of unmixed pleasure for the roadmaster, for while we must give the Irish foreman credit for being a good track man, in a good many cases he certainly did not live up to the instructions in rule G. The roadmaster of that period was also different, and if we believe the legends handed down was a somewhat hilarious and swashbuckling character, a favorite with the ladies, although in some respects probably more efficient than he is to-day. We must not forget, however, that they were the days of light rail, dirt track and stub switches, and the good foremen of that date would, without more experience, be hardly fit for a track walker now.

From my personal experience I am of the opinion that the section foreman to-day is doing better work and maintaining his track in better condition than ever before. While a number of people seem to think we need a better class of foremen my idea is that we need better conditions for the men we now have. In these days with the cost of living rising out of all reason, it does not take an expert to see that it must be hard for the section foreman receiving $55 or $60 per month to make ends meet. This fact was recognized by the management of our road, and the very liberal bonus distributed at Christmas was a godsend to many a section foreman. It showed a disposition on the part of the company to help them out that was very greatly appreciated and will not soon be forgotten.

ROADMASTER.

RECRUITING AND HOLDING FOREMEN

LA GRANDE, ORE.

TO THE EDITOR:

Mr. Clark's contribution on the foreman problem in the January number of the *Railway Maintenance Engineer* contains progressive suggestions on this subject, and there is no reason why they should not work out on most of the railways. In the northwestern states where foreign labor is employed entirely, an apprentice system can only be applied to the foreign employees, as no American will work with a pick and shovel side by side with a Greek or Italian. That is against his nature.

Most railways in this part of the country have to depend on the eastern states for their experienced men. To do so there must be an inducement. A scale of wages graduated according to ability and length of service would be a very important factor. Division officers should be the ones to determine the rates for their foremen. There are many young, intelligent foreigners who will make good foremen for ordinary work if properly trained. This could be done easily by arranging for each division maintenance of way officer to place those men in charge of competent foremen, who should be compensated for giving them all the necessary instructions pertaining to track work. As long as the management of a railway is centralized and one scale of wages is established for the whole system there will be very little improvement in any branch of the service where the labor is not organized, as general managers do not give much thought to those classes of labor. Maintenance of way officers know what should be done and where the trouble is, but their hands are tied. The only recourse they have is to do the best they can.

F. A. ELESCKE,
Extra Gang Foreman, O. W. R. & N. Co.

NEW BOOKS

Standards of the American Society for Testing Materials. Edited by Edgar Marburg, secretary-treasurer. 737 pages. Illustrated. 6 in. by 9 in. Bound in cloth. Published by the American Society for Testing Materials, Philadelphia, Pa. Price $7.50.

Beginning with 1910, the standards adopted by this society have been published annually in a year book which also contained the proposed tentative standards which had not yet been accepted by the association. Beginning with the present volume, the standards will be published biennially and will include only those which have been formally adopted by the society, excluding those which are only tentative. Among the specifications of most interest to maintenance men are those for rails, splice bars, track bolts, bridge steel and Portland and natural cement. As this society is composed of representatives of the manufacturers and the users of these materials, the specifications which have been adopted from time to time may be considered to represent the best practices from their combined viewpoints.

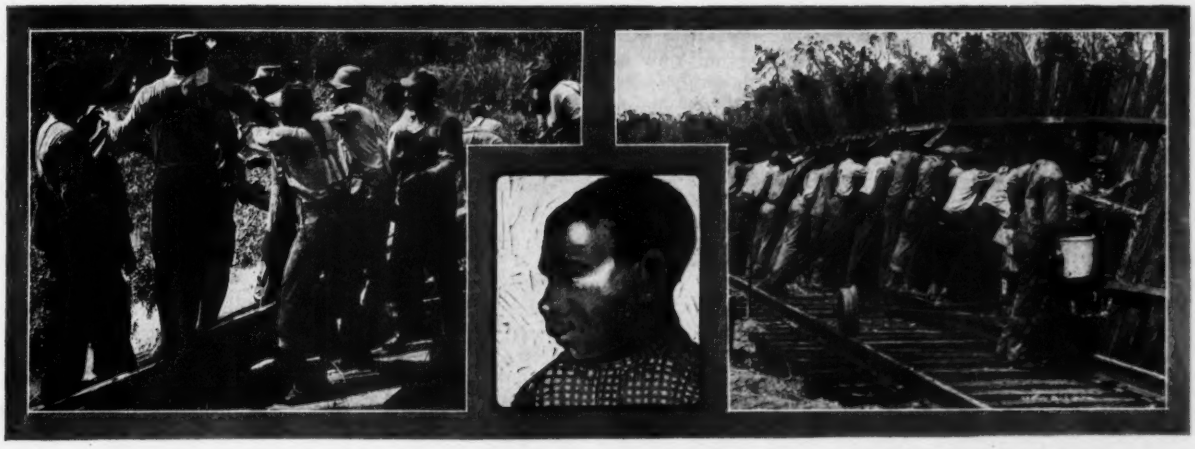
Handbook on Wood Preservation. 74 pages, 6 in. by 9 in. Bound in cloth. Published by the American Wood Preservers' Association, F. J. Angier, secretary, Mt. Royal Station, Baltimore & Ohio, Baltimore, Md. Price, $1.00.

The purpose of this book is to present in concise form the essential information concerning the preservation of timber which has appeared in the proceedings of the American Wood Preservers' Association and elsewhere during recent years. The book contains a chronology of the development of wood preservation in this country and data regarding the extent to which ties, piling and other timber used are treated and maps showing the location of timber treating plants. The common processes are described, together with the materials used. The book also contains a bibliography of wood preservation. It contains much valuable information regarding this construction material which is of particular value at the present time, when timber is receiving special attention because of the high price of other materials.

Passenger Terminals and Trains. By John A. Droege, general superintendent, New York, New Haven & Hartford. 392 pages, 220 illustrations. 6 in. by 9 in. Bound in cloth. Published by the McGraw-Hill Book Company, 239 W. 39th street, New York. Price $5.00.

Although written from an operating standpoint by a transportation man, this book is of interest to many maintenance of way men because of the large amount of space devoted to the design and maintenance of modern passenger terminals. The author has been identified for many years with the operation of the New York, New Haven & Hartford, a road with an unusually large proportion of high speed passenger travel, and he is, therefore, familiar with the practical problems arising in this service. Following the general introductory chapter are several devoted to the design and construction of stations and their track layouts with descriptions of recent examples of modern structures. The larger portion of the book is devoted to the operation of passenger terminals and the methods of handling passengers, baggage, mail and express through the stations. Space is also given to passenger terminals in foreign countries, to the operation of passenger trains, accidents and their prevention and the commissary. The book closes with a chapter on statistics of passenger service.

This volume summarizes the present practice in station design and construction and is copiously illustrated with photographs and drawings of the more important stations of this country. It, therefore, fills a distinct niche in this field of railway literature in which relatively little has been written; it should be of distinct service to all railway men confronted with the operation or maintenance of passenger terminals.



THE NEGRO AS A MAINTENANCE LABORER

Two Discussions of the Characteristics of Employes of This Type Who Are Moving North in Large Numbers

AT no time in recent years have labor conditions in the maintenance of way field been as chaotic as at present. Last year few roads were able to secure enough men to keep their gangs full and as a result men were drawn into this service from sources never before developed to any extent.

One of the principal migrations was that of negroes from the South, who came into the northern and eastern states in large numbers. One writer has estimated that over 325,000 negroes have moved north during the last two years. Many of these have secured employment as track laborers. This has resulted in many foremen being placed in charge of gangs of men of this class who were unfamiliar with their characteristics and who, because of this, failed to secure the best results from them. The southern negro has strong racial characteristics and these must be recognized by those who would secure the greatest amount of work from him.

The indications are that negroes will be employed in track work in largely increased numbers during the coming year. The following discussions have been prepared by men experienced in handling this class of labor with the belief that they will be instructive to those men who will work negroes this year for the first time:

THE CHARACTERISTICS OF THE NEGRO

By KENNETH H. HANGER
Division Engineer, Chicago, Rock Island & Pacific, El Dorado, Ark.

The negro is probably the best class of labor that can be recruited at the present time for railway maintenance work. While I believe that they can still be obtained in considerable numbers in the central south during the coming season, it will be somewhat more difficult to recruit negro labor than formerly, owing to the unusual industrial activity in the South at this time. For this reason a railroad intending to employ negroes should start its campaign of organization as early in the season as is practicable.

If a rate of pay equal to that of adjacent industries can be met or exceeded a trifle, and reasonable assurance of a season's work given, the best class of negro labor can be drawn to railroad maintenance work. In the South this can be done at a rate of pay considerably under the mid-season rate paid to other classes of labor in the northern and north central states.

To transport him to a new and unfamiliar section of the country a rate of pay approximating that paid the usual run of foreign labor (which is higher than the pay for track labor has been in the South for several years) will, I think, be found sufficiently alluring to attract quantities of negro labor. Section laborers in this part of the South are paid from $1 to $1.35 per day, extra gangs from $1.35 to $1.50 per day, and track-laying gangs probably up to $1.60 per day. The almost universal rate of pay for negro track labor on the saw-mill roads is $1.50 per day the year round. Doubtless a rate of $1.75 to $2.00 per day will be required to entice him from the cotton fields and pine woods to the northern states for the season.

Some provision other than the commercial labor agency should be made by a road intending to utilize negroes for a season. The agency may properly be called on to aid in gathering up the men, but someone directly connected with the road for which they are to work will prove a valuable factor, for his information will be of a more direct nature, and can be relied upon because of his better knowledge of the nature of the work the men are to do, its location, the rate of pay and the frequency of pay days. Once a supply of negroes has been obtained, negro "men catchers" will be found most useful in keeping the ranks filled; a good, reliable negro who can fill this position will usually be found in any fairly good sized gang.

The negro is attracted to the bunk car. He prefers it to other habitation. Ten to twelve men can be housed in an ordinary 36-ft. bunk car; ten is enough if the weather is hot. Naturally, each bunk should have a window beside it. If the car is kept clean, it will be because the men are made to keep it so. They do not furnish their bedding.

A boarding outfit for feeding the negro is quite satisfactory, provided it can be run at a rate consistent with his pay. Corn bread, biscuits, molasses, bulk pork, corn, field peas, sweet and Irish potatoes and coffee are staple articles of his diet. I believe a boarding outfit is to be preferred to allowing them to feed themselves, as they eat more and therefore work better. If they feed them-

selves they frequently yield to the temptation to economize too greatly. If a commissary is run, and it will be a necessity if a boarding car is not run, it should only be allowed to make a reasonable and legitimate profit if the gangs are expected to stay. The commissaries should furnish the men with articles such as gloves, work shoes, tobacco, foodstuffs, overalls and other articles that they are likely to need daily. Such boarding camps as are being run in this vicinity are charging the negro $4 per week for board, although the period that this rate can be continued under the present rise in price of foodstuffs is uncertain.

For extra gang work, a level-headed foreman, whose supervision should be educational rather than abusive, and an assistant foreman, whose tactics should be similar, should run a gang of 60 or more men. In ballast work these men can pick out a competent negro track raiser and a track liner (this can easily be done if railroad negroes have been recruited). These men should be paid about 15 per cent more than the laborers; the jackmen also can well be paid an amount somewhat above that of the ordinary laborers. This considerably accelerates the speed of the gang, and lets the foremen give their time to general supervision and to pushing the work. In laying rail a similar scheme of pay can profitably be effected for the harder jobs.

Once organized and trained, a negro gang makes a better, faster ballast or rail-laying gang than any foreign gang I have chanced to work. Many negroes are excellent spikers and take considerable pride in their ability to do their work rapidly and well. The negro track gangs kept constantly employed by the lumber companies furnish excellent examples of organization, training and snappy work. Of course, these men are employed the year round, laying and taking up logging spurs, but it indicates that, properly fed and supervised, the negro can produce excellent results as a trackman.

For supervision, the negro does not need constant nagging, watching, teaching and checking up, but one must remember that his training of a lifetime has been that, when a white man in authority spoke to him, he was to do as he was told, and that his boss really meant what he said. Discipline should be firm, sometimes stern, but not abusive. Constant picking at and nagging soon cause him to believe that but little is meant by what is said, and but lagging results are the reward.

Numerous foremen run negro gangs with but few words, quietly and without loss of temper, and with excellent results. The negro fully realizes that his boss wants him to do as he is told, and he does it. These foremen look after their men's welfare, make them take care of themselves, see that they properly attend to any injuries they may receive and that they get themselves medical attention when ill, and handle them much as a white officer would his negro troops in the army.

For bridge gangs engaged in timber trestle work, the negro makes a very good man, either when driving piles or framing or decking. Under proper supervision negro gangs do rapid, neat trestle work; they can be trained to be rapid, snappy driver crews. We use them for all wooden culvert work and concrete gangs, though they do not make very good form builders for concrete. They are capable of training as helpers on water service gangs, and to handle and make minor repairs and adjustments to gasoline and kerosene engines. These bridge men and water service helpers range in pay from $1.75 to $2.50 per day. They are far less susceptible to the burning effect of creosote in hot weather than is a white man; in fact, they pay but little attention to it unless some spatters in their eyes as the hammer strikes a pile head. When working around water, a negro will wade in, get wet and do his stunt, while the average laborer is building a scaffold to avoid the water.

He is capable of promotion to a section foreman, where switch work is simple and trains are not too thick. A likely contest for the annual foreman's prize on this division this year is a negro.

Unlike the Greek, Italian or other European, the negro has but little hoarding instinct, therefore he is unable to carry himself for a month at a time, so monthly pay days are unsuited to him. Frankly, he wants his pay every Saturday night, and there is no larger factor in keeping him satisfied with his job than this. He does not care to work Sundays, and is not educated up to the practice of demanding that he be allowed to do so and be paid a 50 per cent bonus per day for so doing, as the south European does when he knows you need him, and he can go over to the neighboring road and go to work. His outfits should not be run as missions. He is a born gambler, but, fortunately, causes little trouble by drinking. He will not stay where there are no women of his kind, and this may as well be recognized.

He asks fewer special privileges than any class of foreign labor—occasional passes, but not many. He will expect transportation to the work, and home again at the end of the working season, for the negro from the South is going to return there when the weather gets cold. One is free of the trouble of handling his men through a padrone and interpreter, and the negro has not been trained to demand camp watchmen and bread cooks at the railways' expense. Pay him what you say you will, when you say you will, live up to your side of the agreement, give him intelligent supervision, and make as much allowance for his racial traits as you would for south Europeans or Mexicans, and the negro will do more work and cause less trouble than any of the lot.

THE STAYER AND THE DRIFTER

By J. T. Bowser

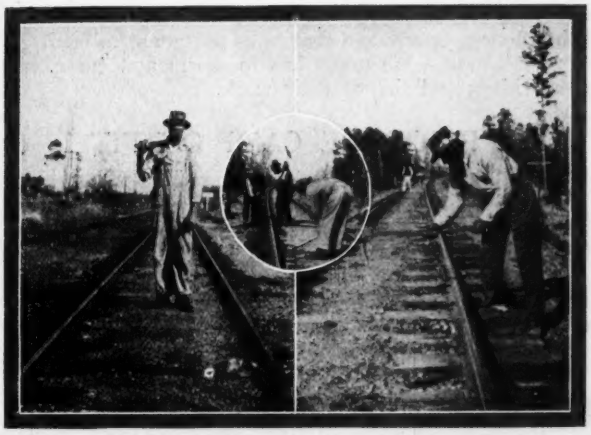
Queen & Crescent Route, Danville, Ky.

The past year has witnessed a very considerable movement of negro labor from the southern states to the North, and the probable effect of this movement on the labor situation and the race question in the North has been the subject of considerable speculation on the part of those interested in industrial and social problems. Just to what extent this influx of labor will affect the track labor problem remains to be seen. While a very considerable portion of those negroes who have migrated to the northern states are of a class from which track labor has been recruited in the South, track work is not likely to see a great many of them so long as the present demand for labor for contract or other classes of work of more or less temporary character which usually pays a higher wage remains as sharp as it is.

The negro compares well with the average laborer of other races for track work, and if properly handled makes an excellent track laborer. He is a born imitator and readily acquires a very considerable skill at almost any kind of ordinary work, if he is intelligently directed. Further, he takes an almost childlike pride in his skill and usually responds quite readily to the stimulation of rivalry or pride of achievement.

So far as track work is concerned, negro labor may be divided roughly into two classes, the stayers and the drifters. The North is not likely to see much of the former class in the near future, for, though the "promised land" of the North holds a very considerable attraction for the men with families, those of this class who

are likely to go north in any considerable numbers at the present time, *and stay north,* will be largely those who may be classed as semi-skilled—molders, furnace men, miners, and the like—who will be able to command a wage that will enable them to support their families under the much more expensive living conditions. As to the "stayers" with which the track men of the North may have more experience later, it may be said that they make excellent section laborers, and, in fact, it is on them that southern roads depend almost entirely in many localities. They are usually men with families. Many of them have been in the service of one road or even on one section for from 15 to 20 years. There are many who have spent their entire working life on one section. These men can be depended on to be on hand for emergencies, and while



THE NEGRO IS A NATURAL TRACKMAN

many of them will lay off more or less during the month, a large proportion will put in every hour that they can be used.

The drifters are of quite a different type. They are usually younger men, nearly all unmarried, and in perhaps the majority of cases they have no real home or family ties. In the South this class is used almost entirely on extra gangs, since camp cars and commissary afford quarters and food, and the more or less roving life suits them better than the humdrum section work. As a class, these men are dissipated and inveterate gamblers. Many of them are more or less desperate characters, and quite a few have penitentiary records. However, in spite of these facts, they can and will do excellent work if properly handled, and if the conditions are suitable to their temperament. For instance, it need not be expected to get much if any work out of these men during cold weather, as they are not prepared for it as to clothes, manner of living, etc. With them there is no question of loyalty, necessities of family, or desires to hold a job, to take them out during extreme weather. However, since the majority of the extra gangs are worked only in the summer in the North, this phase of the question is not so important.

METHODS OF ENLISTMENT

As to the methods of enlistment, they again divide themselves into two classes. The stayers can only be enlisted by the colonization method, except at points where there may already be a negro colony of some size. In the latter case, permanence or steadiness of employment, together with a foreman who has a knowledge of the proper method of handling negro labor, will determine the success with which a regular section gang can be recruited and held. In establishing a colony it should be remembered that the average negro is wholly unused to extreme cold and dislikes it intensely. Therefore, colonization in extremely cold climates will be difficult. The men may be held if comfortably housed and required to buy the proper clothing, but their families will not likely be satisfied and the colony will probably fail.

The provision of laborers' cottages at a nominal rental (which must be deducted from the wage) is almost absolutely necessary for the success of such a plan. Four or five families from the same neighborhood would probably hold together as a colony better than would families from different sections of the country. In any case it will probably be necessary to provide free transportation for families and effects, since the family exchequer is rarely equal to such a strain. Any such move should be effected in time to get them thoroughly settled down before cold weather.

The enlistment of the floaters is accomplished in the South by means of labor agents, or by means of members of the gang who act as bellwethers in getting the flock together.

These labor agents are not of the type familiar to the employer of the North, but are usually negroes who become extremely shrewd in handling men of their own race. Leadership of some kind is absolutely necessary if a gang is to be held together and desertions en route prevented. These floaters are inordinately fond of traveling, and will often undertake a trip with the labor agent with no intention of going to work, and outwitting the agent is considered one of the fine points of the game.

Payment for men recruited is handled in various ways, sometimes by the employers direct on delivery at the work, more often, in the case of the railroads, by deduction from the wage of the laborer. The latter course stimulates the agent in his efforts to secure men who will stay for a while at least. Free transportation is, of course, necessary.

This recruiting must go on constantly, as the men drift back to the cities as soon as they have made a pay day, and often before. They are usually ready to return to work of some class or other as soon as they have spent what money they have. Provision is also made to feed the men en route, this being usually handled by the labor agent, he either standing the expense himself or making some arrangement with the employer to collect it. Many southern roads have such arrangements made with one or more men, who make their living by handling laborers to these gangs. The matter of transportation has to be watched very closely, as it is something of a temptation to these labor agents to have the opportunity, as they do, to handle men over the road on these passes for a few dollars, when the men have no intention of going to work, but take this method of saving something on railroad fare.

FEEDING AND HOUSING

The method of housing the men with families has been referred to above. They will, of course, handle their food themselves. However, the average negro is quite improvident and lives from hand to mouth. Many of them are thoroughly reliable in the matter of credit at the grocery, but as a class, provision will have to be made to protect the merchant who credits them, for they must have credit. Cash in hand lasts only until it can be spent, which is usually within a very short time. The stoppage system will take care of the credit feature, however. Under this system the foreman gives the man orders on the merchant up to a certain per cent of his earnings, and stoppage is made on the rolls in favor of the merchant for this amount.

Floaters are usually housed in camp cars, bedding and fuel being suplied by the railroad company, the for-

mer item often at the expense of the laborer. These men rarely have anything of this kind of their own as they travel by freight a great deal and must travel light. They therefore must purchase anything they want in this line in addition to the regular outfit which goes with the bunk. The floaters cannot be depended upon to run their own commissary and it is handled in several different ways on different roads. Under one system the foreman operates the commissary on his own account, being protected for payment of board by stoppage on the pay roll. Another system is that of the usual commissary contractor, while a third is that under which the railroad boards the men as a part of their pay, the rate being less in this instance, by the estimated average cost of board. The first method is not always satisfactory, as it leads to overcharges for board and dishonesty, while under the contract system the food is likely to be poor and insufficient, so that dissatisfaction is caused in each case. Under the third system, however, the railroad provides the cook and supplies, and while there seems to be room for loss by theft and wastefulness, the cost of meals can be kept at a surprisingly low figure by means of careful buying and checking.

Organization of Gangs

The organization of negro labor in section gangs, where the stayers are usually found, differs very little from that of the ordinary section gang of any other class of labor. When the entire gang is composed of negroes it is well to develop one of them into a "straw boss" if a man of the proper stamp is available. He will, of course, have no real authority, but as a negro thoroughly enjoys his slight elevation over his fellows he will be of considerable assistance in keeping the gang in line.

The organization of the negro extra gang usually consists of the foreman, the assistant foreman, the cook, the laborers and the flunkey who assists the cook and looks after the camp. In many gangs of laborers there is usually an unofficial official who makes his presence known when the gang is engaged on classes of work requiring concerted action, such as loading rail, unloading rail or lining track. This man is the caller. He is a musical soul, who assumes his position by common consent and without special appointment. The accent of his chant, which is usually impromptu, enables the gang to act in unison. It is a wise foreman who leaves this phase of the work in his hands, though at times it may be necessary to speed up the tempo of his lay to some extent.

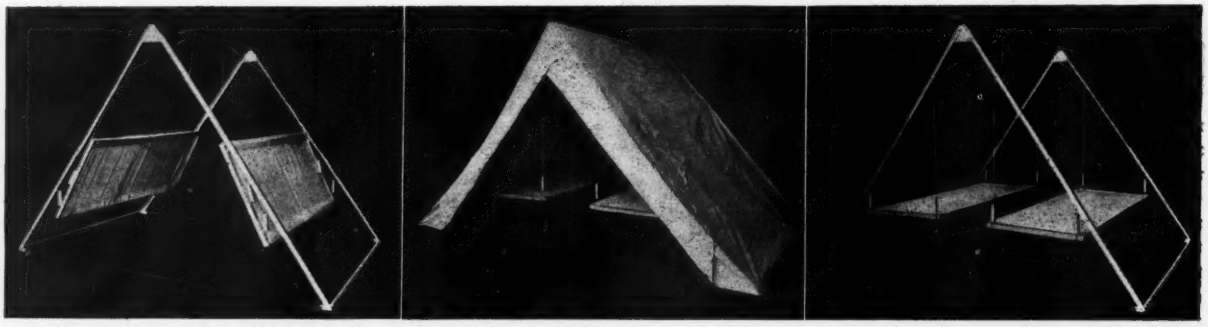
The negro requires a method of handling that is peculiar to himself. There must be discipline of a peculiar sort. There is something childlike in his makeup that requires a good-natured firmness with an occasional indulgence, rather than cold, impersonal exaction. A good foreman on a negro gang is something of a father to them; he will keep their money for them until they get ready to go to town and will be rigidly honest with it. He will stand between them and their more innocent scrapes, he will look carefully to their food and will see that their cars are reasonably comfortable, and above all things he will see that they get their money when they expect it. Still he must never be anything but "de bossman," he must be quick and just in his discipline. Vacillation and failure to require proper respect mark the "pore white trash" in the negro's mind, and his respect for such is less than nil.

They like a man who commands their respect and is rough and stern enough when the occasion demands it, and they take a certain pride in belonging to his gang. The stayers remain with him and the drifters come back again and again. He gets all the skill and ability they have, for they know that he knows when the work is not being done properly and that he is not going to let it go for an instant. He never has to storm and curse, his men whistle and sing at their work.

A PORTABLE CAMP OUTFIT

FROM the present indications, the roads will be forced to give more attention to the care of their laborers in the maintenance of way department this year than ever before, if they are to retain a number sufficient for their needs. The ordinary bunk car with its wooden bunks is unsatisfactory in a number of ways from the standpoint of the men. It is particularly hot in the summer time, while it is difficult to keep the cars sanitary and fit for use. For these reasons a few roads have already substituted camps for cars, particularly for their floating gangs. The Gosso Company, Chicago, has designed and is now placing on the market a small combined tent and bunk for use in this way. It consists of a steel A-frame supporting a canvas covering with two bunks suspended from it, which can be folded up out of the way. The tent is 11 ft. wide, 8 ft. 6 in. long and 6 ft. 7 in. high and the entire outfit can be packed in a box 10 in. by 12 in. and 4 ft. 8 in. long, which weighs 150 lb. complete. The tent frame is composed of angle irons with round-rod knee braces at the points where the ridge pole connects with the A-frame and with wires connecting the sides and ends at the bottom. The bunks are also built with frames of angle irons and are suspended from the legs of the A-frame by suspender rods and coil springs.

Among the advantages claimed for this type of camp outfit are the elimination of the necessity of taking cars out of revenue service during this time of car shortage and the further expense of fitting them up for use as bunk cars. With the use of tents the camps may be established along the right of way without spurring out cars.



THREE VIEWS OF THE PORTABLE CAMP

STANDARDIZING THE DESIGN OF FROGS

The Third Article in the Series on Special Track Work Compares the Practices of Different Roads*

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AT the intersection of the main and side track rails at a turnout a cross piece must be inserted to allow a passageway through which the wheel flanges cross from one rail to another; in this country this cross piece is termed a frog. It is usually made of 4 pieces of rail, properly shaped and planed and held together by rivets, clamps and bolts. It is also made in one piece castings. The principal parts of a frog are termed as shown in Fig. 1.

Angles of railroad frogs have been standardized by proportioning them in even multiples of the spread to the length. Thus if the spread is 1 unit in a length corresponding to 8 units, the proportion is 1:8 and the frog is called a No. 8 frog. The practice of measuring the frog varies, some measuring the length along the center line of the frog (the bisector of the angle), while others measure along the gage line. There is but little difference between the two methods, but for the sake of uniformity it would be better to adopt one of the two methods. The American Railway Engineering Association recommends that the first method be used.

Where the two point rails come together to form a point, it is obvious that they cannot be brought out to a feather edge and it has therefore become the general practice to blunt off the point to where the spread between gage lines is ½ in. This is called the actual or working point of the frog in distinction to the theoretical point at the intersection of gage lines.

There are two methods of forming the point of the frog—one by notching the she rail and shaping the he rail to suit, as shown in Fig. 2, and the other by running both rails out to a point as shown in Fig. 3. The former method is the most generally used as it avoids the feather-edge point of the she rail. In either case the rails are bent before shaping or planing, so as to bring the web of the rail vertically right under the extreme point. (See Section AA, Fig. 1.) The point rails are riveted together and sometimes a filler is placed between the two rails. The wing rails are properly bent and their flanges are sheared or planed to clear the base flanges of the point rails. The opening between the wing and the point rails is called the groove, or flangeway, and this distance is usually held to a fixed dimension by means of fillers which are kept in position by bolts. This groove or flangeway is generally made 1¾ in. wide on straight track, which is sufficient clearance for Master Car Builders' standard wheel flanges and limits of wheel setting. Wider grooves may be required on curves or under special conditions. Grooves should be 2 in. or 2¼ in. deep to allow for top wear, but should never be less than 1¾ in.

LENGTH OF FROGS

There is no absolute rule for the lengths of frogs, different companies calling for different lengths. A standard in this respect is very much needed. A good rule recommended, but not generally followed, is to make the length in feet equal to 1½ times the number of the frog and dividing it so that the length from the working point to the heel of the frog is equal to the number of the frog in feet. A few companies follow this rule above a No. 10 frog. Many companies call for a frog 15 ft. long for angles from No. 7 to No. 10, inclusive, and a frog 10 ft. long for angles of No. 6 and below.

The No. 8 and No. 10 frogs are most commonly used in ordinary main line tracks, while for high-speed lines with easy turnouts No. 12, 15 and 20 frogs are required. The No. 4, No. 5 and No. 6 frogs are generally used in yard tracks, although some roads will not allow angles as sharp as these to be used on their lines, except under very special conditions. In fact, the No. 4 frog necessitates such a sharp curve that it can only be used by switch engines with short wheel bases. Below is a table showing frog numbers and their angles, as recommended by the American Railway Engineering Association:

Frog No.	Angle	Frog No.	Angle
No. 4,	14 deg. 15 min. 00 sec.	No. 9½,	6 deg. 01 min. 32 sec.
No. 4½,	12 deg. 40 min. 49 sec.	No. 10,	5 deg. 43 min. 29 sec.
No. 5,	11 deg. 25 min. 16 sec.	No. 10½,	5 deg. 27 min. 09 sec.
No. 5½,	10 deg. 23 min. 20 sec.	No. 11,	5 deg. 12 min. 18 sec.
No. 6,	9 deg. 31 min. 39 sec.	No. 11½,	4 deg. 58 min. 45 sec.
No. 6½,	8 deg. 47 min. 51 sec.	No. 12,	4 deg. 46 min. 19 sec.
No. 7,	8 deg. 10 min. 16 sec.	No. 14,	4 deg. 05 min. 27 sec.
No. 7½,	7 deg. 37 min. 41 sec.	No. 15,	3 deg. 49 min. 06 sec.
No. 8,	7 deg. 09 min. 10 sec.	No. 16,	3 deg. 34 min. 47 sec.
No. 8½,	6 deg. 43 min. 59 sec.	No. 18,	3 deg. 10 min. 56 sec.
No. 9,	6 deg. 21 min. 35 sec.	No. 20,	2 deg. 51 min. 51 sec.

In standardizing plans a company should adopt just as few angles or numbers as possible. Unless there are unavoidable reasons, Nos. 6, 8, 10, 15 and 20 frogs are sufficient for all needs. The fewer the different numbers that are used on a system the greater will be the economy and frogs can be interchanged more easily. Curved frogs should be avoided as far as possible, as they increase the expense and are not interchangeable.

TYPES OF FROGS

Frogs may be classed into two constructions, "plain bolted," composed of rolled rails fastened together, and "manganese steel" construction. Each construction again comprises several types. Under "plain bolted" frogs are included: "rigid bolted," "plate-riveted," "clamped" and "spring rail" frogs. Under "manganese construction" are included the manganese steel "rail-bound" and "solid" frogs.

Nearly every railroad has a special design of its own for rigid bolted frog construction. They differ in many details, such as the length of wing rails, the length and nature or material of the fillers, the number of bolts, the style of heelblocks, the use of tie plates or base plates, etc. No two designs are alike. For illustration, the following table will show the number of bolts and the kind of fillers at the point of the frog, and their length as required by different roads for their No. 8 frogs:

Road	No. of Bolts	Fillers
A. C. L.	7	4 R. S. fillers, 15 in. long
B. & O.	12	2 R. S. fillers, 3 ft. ½ in. long
B., R. & P.	10	2 R. S. fillers, 2 ft. 6 in. long
C. of Ga.	9	2 R. S. fillers, 14 in. long 2 R. S. fillers, 8 in. long
C. R. R. of N. J.	8	C. I. fillers,
C., C., C. & St. L.	14	2 R. S. fillers, 3 ft. 6 in. long
L. & N. E.	11	2 R. S. fillers, 5 ft. long
N. Y. C.	12	C. I. fillers,
N. Y., N. H. & H.	11	C. I. fillers,

*The first article of this series on "The Design of Special Track Work" appeared in the December issue, page 369, and the second article, on "The Correct Design of Split Switches," in the January issue, page 13.

Road	No. of Bolts	Fillers
P. R. R.	14	2 R. S. fillers, 14 in. long 2 R. S. fillers, 8 in. long
P. L. W.	14	2 R. S. fillers, 5 ft. 6½ in. long
Southern	9	2 R. S. fillers, 14 in. long 2 R. S. fillers, 8 in. long
Western Md.	8	2 R. S. fillers, 3 ft. ½ in. long

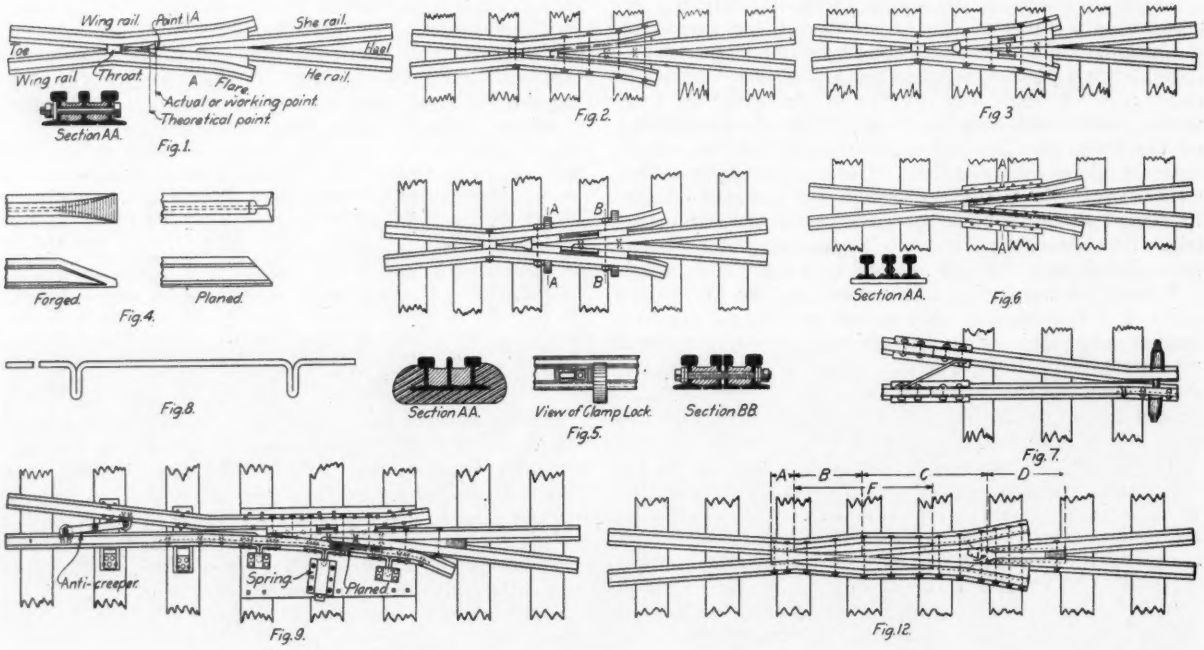
R. S., rolled steel. C. I., cast iron.

There would seem to be no good reason why there should be such differences The American Railway Engineering Association has recommended a rigid frog, which may be somewhat more expensive than some of the above frogs, but it represents good average practice. It has 13 bolts and the point fillers are of rolled steel 3 ft. 4 in. long. It is perhaps as rigid a frog as can be manufactured.

All frogs, whatever their construction may be, should have a heel or raising block in order that the so-called

At the end of the wing rails the grooves must be widened out gradually or "flared," so that the flanges of wheels entering the frog from the heel will be guided gradually into the narrow groove. This flaring may be done by planing the side of the head of the rail or by bending the rail. Experience has shown that well-maintained trucks seldom strike the flare beyond a width of groove of 2½ in. It is, however, usual to make the widest opening at the extreme end as much as 4 in. wide to preclude any possibility of striking the end of the wing rail even if the track is somewhat out of gage and the wheels worn to an extreme. The effective part of the flare should be as easy as possible, and on no greater angle than about 1 in. in 1 ft.

Many railroads now require the ends of the wing rails to be cut on an angle with the vertical or to be forced down to lessen the danger of chains or other appendages



false flange formed on the outside of hollowed-out worn wheel treads may rise to the tread surface of the frog and not produce a wedge action where the he and she rail come together and tend to loosen the frog. Heel-blocks are made in various ways: of cast iron, cast steel, cast-iron filler with a piece of T section cast in and of pieces of rail properly forged and planed. The latter appears to be the most popular practice, being used the most, but the best is either the cast steel or the forged steel heel-block, which entirely fills the fishing section of the rail. This is at the same time the most expensive, but it adds materially to the rigidity of the frog.

Rolled steel fillers (fillers rolled to the fishing section of the rail) should be used in preference to cast-iron fillers. There is a difference of opinion as to whether these fillers should start at the actual point of the frog, or 4 in. or 5 in. in front of the point. There seems to be no necessity for the latter method, the only difference being that a railroad has to pay for some additional planing and fitting. Fillers at the point should be of sufficient length to provide for not less than 2 through body bolts, passing through both point and wing rails. Wing rails should lap the point not less than 20 in. and allow of an easy flare.

of cars that may have dropped down, catching on the ends (Fig. 4). This practice is to be recommended.

BOLTS, CLAMPS AND RIVETS

It is hardly necessary to point out that the rigidity of a frog depends on good bolting, and it therefore has become the general practice to use heat-treated bolts of high tensile strength. The size of bolts should be governed by the width of the fishing section of the rail. The sizes recommended are as follows: 1⅜ in. diameter for rails with fishing section over 3⅜ in.; 1¼ in. diameter for rails with fishing section 3 in. up to and including 3⅜ in.; 1⅛ in. diameter for rails with fishing section 3 in. down to and including 80-lb. rails.

The height of fishing section should be measured on the vertical center line of the rail. The fit of the bolts is a further important point and the more general practice of the manufacturers is to drill the bolt holes in one setting through the assembled frog, so that the bolts will have practically a driving fit in the hole.

A further important aid to the life of the frog is a good support, not only for the frog itself, but for the individual parts, by the use of tie plates or base plates. Two or three tie plates 6 in., 7 in. or 8 in. wide should

be used, one being placed directly under the point of the frog, while large base plates add to the rigidity of the frog, they have the objection that they interfere with the tamping of the ties and are more expensive. Most roads rivet the plates to the frog, although a few bolt them on by means of clips or clamps.

With keyed or clamped frogs, the various parts are held together by clamps either entirely or in addition to bolts. With the improved bolts of high tensile strength, frogs of this type are going more and more out of use. The clamps require frequent attention to see that they are kept tight, and sometimes interfere with the spacing of the ties. Fig. 5 shows a clamped frog.

With plate-riveted frogs, instead of bolting or clamping the rails together with fillers, they are riveted to a large base plate through the base flanges of the rail. This type is used mostly in industrial plants, and in no case

FIG. 10—HOLD-DOWN AND ANTI-CREEPER

should a frog made of 60-lb. rail or above be riveted. Fig. 6 shows a typical plate-riveted frog.

SPRING FROGS

The open flangeway in rigid frogs which has to be crossed by the wheel tread, necessarily causes a jolt and considerable wear. To avoid this the spring rail frog has found quite general introduction on main lines, one of the wing rails in normal position lying close up against the point, and thereby giving a continuous passage for the wheels on the main line. The wheel going into the siding pushes the wing rail away from the point sufficiently to allow the flange to pass through the movable wing, being then immediately returned to its normal position by the spring. The proper action and safety of a spring frog depends upon the guard rail, which must be placed opposite the spring wing on the main line to prevent the wheels traveling on the main line from pushing the spring-wing out and away from the point. As this forms a somewhat objectionable feature and since manganese steel frogs have overcome the question of excessive wear by wheels crossing the open grooves of a rigid frog, the manganese steel frogs are preferred by many, even for main line work.

Spring rail frogs are generally made either of No. 8 or No. 10 and seldom as high as No. 15, and should be not less than 15 ft. long in order to give a reasonable length of movable wing rail. The American Railway Engineering Association has recommended a spring frog, but it is more expensive than the average spring frog used by most roads, owing to a large number of bolts and the rigid wing rail being reinforced on both sides of the web of the rail. Almost every road which has a special design of its own for the various parts of a spring frog has different parts, different ways of arranging these parts, and in the majority of cases only meaning a different way of attaining the same object. There again is a great need of a more uniform standard.

The point of the frog and the fixed wing rail are generally secured together similarly to rigid frog construction. The movable or spring wing must be provided first, of course, with a spring, then with devices to hold it down and to brace it when pushed over and with stops to prevent it from being pushed over too far. It also should be provided with an anti-creeping device or anchor to hold it longitudinally in its proper relation to the point of fixed wing.

Springs are usually encased either in cast iron or malleable iron boxes, preferably the latter. Some roads place the spring at the throat of the frog where the wing rails are closest to each other, while others place it back of the point of the frog acting against the outside of the spring wing only. The former is the simpler, and more generally preferred. Two springs are used, incased in boxes bolted to the outside of the stiff and spring wing with a rod or bolt passing through both and acting on the springs. See Fig. 7. In the latter the spring box is secured to a base plate and it usually also forms a stop. (See Fig. 9.)

Hold-down yokes or boxes are usually forgings made of metal ⅜ in. or ½ in. thick. A railroad designing these pieces should not tie a manufacturer down too closely to certain dimensions, so that he can use existing patterns and dies, as the general dimensions of most of these devices are practically the same. All that is required is the number desired. Usually two hold-down devices are used to a frog. They consist of a guide box and a lug projecting from the spring wing rail. These lugs are now usually made part of the reinforcing bar, Fig. 8. One is generally placed near the point and the other near the end of the spring rail.

In addition, stops and braces are used to hold the spring rail in position. A stop is generally put along the heel end of the spring rail. It is made either ⅜ in. or ½ in. thick and is cut out to hold the base of the rail. The braces are usually made of pressed steel or malleable iron, and two or three are usually put in front of the point. The stops and braces should be riveted to the rolled steel tie plates or base plates, but the hold-down yokes or boxes should be bolted to these plates so as to allow tightening.

Innumerable devices are in the market as anti-creepers and nearly all serve their purpose. The plain anti-creeper strap, Fig. 7, is perhaps the simplest and most economical device. It is made of 2 in. by ¾ in. metal.

FIG. 11—SLIDING WING FROG

The device used by most roads is shown in Fig. 9, consisting of a pivoted arm in the toe of the frog, attached to the rigid and the spring wing rails by clips and bolts. A device used by quite a few roads is shown in Fig. 10. It takes the place of a hold-down and the anti-creeper.

A good-sized plate, preferably ¾ in. thick, should always be placed under the point of the frog and end of the spring wing. It should be large enough to allow the hold-down devices and stops to be riveted or bolted on it. The braces can be riveted to individual tie plates.

There are several other features to be observed in spring frog construction. The head of the spring wing rail should be planed down as shown shaded on illustration (Fig. 9) to prevent the false flanges of the wheels from pushing the wing rail away. The spring wing rail under heavy traffic is usually reinforced, as it is under severe strain. It is customary to place stops and braces so that the spring wing rail movement is limited to about 2 in.

In yards and under slow traffic, frogs with both wings movable, are sometimes used. In these the wings are held apart at the throat by a spacer so that when one wing lies up against the point, the other will stand off to give an open flangeway. The wings in this case do not

depend on any spring action, but a spring is usually placed at the point where the two wing rails are connected as a matter of safety in case the movement of one of the wing rails is obstructed. These frogs are known by the term "sliding wing frogs," Fig. 11.

MANGANESE STEEL FROGS

Manganese steel frogs were first introduced in the United States about 1900. They have amply proven their safety and economy under severe service conditions, including the most extreme high speed service. Some frogs that were installed in express tracks between Philadelphia and Washington in 1903 are still in service. Since then many thousand have been manufactured and installed.

We have here again the troublesome and expensive condition to both the manufacturer and the railroad that

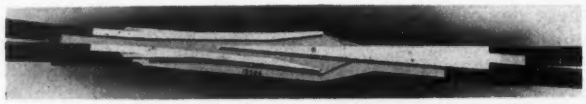


FIG. 13—SOLID MANGANESE FROG

there are too many different designs of manganese steel frogs, especially rail-bound frogs, partly because the manufacturers themselves all have designs varying in some details, and because the railroads themselves have undertaken to get out designs of their own.

Taking a typical design as in Fig. 12, the following table will give an idea of the variation in the designs specified by some railroads:

NO. 8 FROG Length	A	B	C	D	E	F
L. & N.....12' 2"	3½"	22"	3' 8"	23"	5½"	3' 11"
B. R. & P.....13'	3"	24"	3' 4"	25"	5"	4' 8 5/16"
P. R. R.....15'	2¾"	21½"	3' 10¾"	19½"	6"	3' 8¾"
P. L. W.....13'	4"	22"	3' 2"	24"	4¾"	3' 10"
N. Y. C.....12'		21"	3' 7"	19"	5⅜"	3' 10"
Georgia R. R.....12'	3"	24"	3' 4"	20"	5"	4' 9¼"
NO. 10 FROG Length	A	B	C	D	E	F
Southern .....15'	4"	27"	4' 2"	26"	5"	
C. & O.....16'		28"	3' 9"	29½"	4½"	4' 8"
P. L. W.....16'	4"	27½"	3' 11½"	28½"	4¾"	4' 9"
P. R. R.....15'	2¾"	25½"	4' 10¼"	20½"	6"	4' 7½"
N. Y. C.....15'		26"	4' 6¼"	20"	5 7/16"	4' 6¾"

In proportioning the sections of the castings still further variations will be found, and engineers not entirely familiar with the foundry practice necessary in the making and treating of manganese steel castings successfully, are further apt to proportion the castings called for by the design in such a way that the best results, both as to service and safety, cannot be obtained.

The Manganese Track Society, composed of many of the larger special track work manufacturers, has gone into the question of manganese frogs very thoroughly, and has made certain recommendations which the railroads should give their earnest consideration, as they can do no better than to profit by the experience of the manufacturer of this particular specialty. Some of the roads have taken advantage of these designs already.

The manganese rail-bound frog consists of a manganese steel casting to which wing rails, properly bent and planed, are attached to the sides, and point rails properly bent and shaped are attached at the heel of the casting, all of these parts being bolted together. The object and advantage of this construction is, first, that the manganese steel casting is entirely surrounded by the rolled rails, giving additional safety, although the years of actual use have demonstrated that there is practically no danger of the castings giving way, and, second, that the frogs thereby can be made to correspond in length to the "plain bolted" frogs used by the railroads. To make the frogs solidly of manganese steel, in such lengths, would carry them beyond the limits of practicability of manganese castings in many cases.

SOLID MANGANESE STEEL FROGS

Where railroads are not particular to have frogs of the same length as ordinary frogs, the solid frogs of the type shown in Fig. 13 are used, and in some ways are preferable. These frogs are usually made considerably shorter than the ordinary frogs, as otherwise the price becomes prohibitive, aside from the question of practicability, mentioned above. A No. 8 frog would be about 8 ft. long, varying according to the rail section, while a No. 10 frog would be about 9 ft. 6 in. long.

Manganese steel centers have also been applied to spring frogs, Fig. 14, but on account of the high cost have not been used to any extent. Many railroads have found it profitable to send worn manganese steel centers and solid frogs back to the manufacturers for restoration and repairs, providing they are not too badly worn. In many cases by fitting on new rails, bending up the casting in the middle and regrinding the surface, a manganese frog can be restored to good condition, giving considerable additional service.

GUARD RAILS

Guard rails are essential to the safe operation of a frog, and should be placed opposite the frog on both sides. They hold the wheels in line and prevent them from striking the point of the frog, and on that account must be perfectly rigid and maintain the proper opening at all times. They are usually attached to the running rail by means of clamps, cast iron separators and pressed steel or malleable iron braces. They must be long enough to give a parallel groove opposite the frog from the knuckle in the wing rail to past the point, and allow for a long and easy flare on both ends, to guide the wheels gradually into the parallel groove without jar. The general practice is to make them of ordinary rail, but many

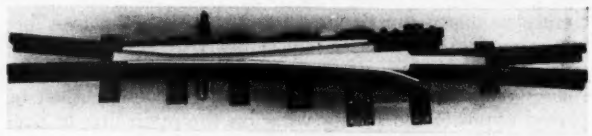


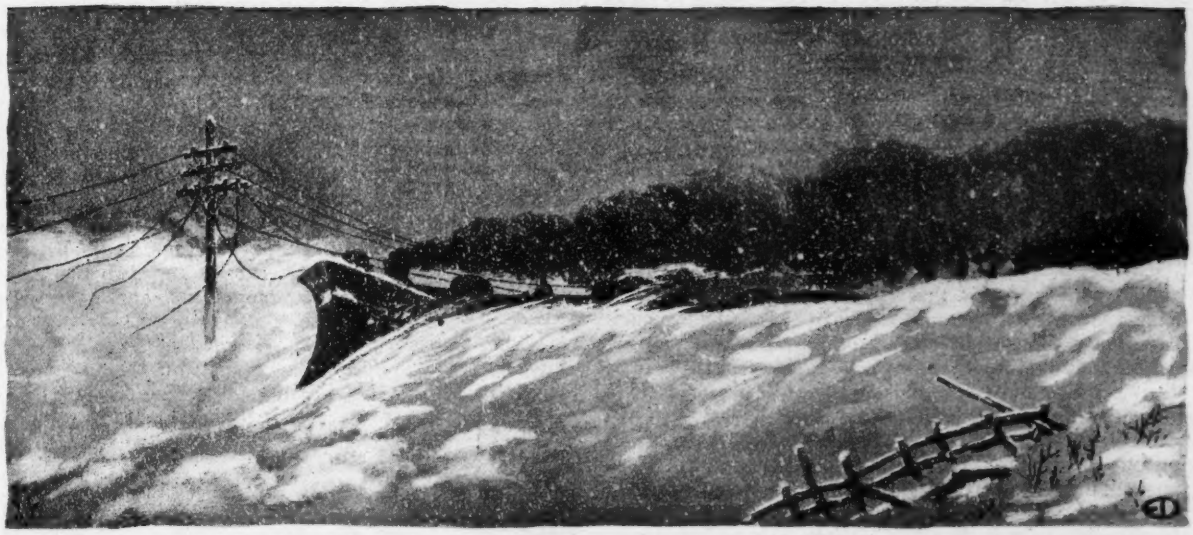
FIG. 14—SPRING FROG WITH MANGANESE STEEL CENTER

devices have come on the market to take their place, including manganese steel castings and forged, pressed or specially shaped rolled guard rails. While many have their good points, the majority do not come up to expectations.

INFORMATION REQUIRED BY A MANUFACTURER

Unless a railroad has standard plans of its own, the following information is necessary to build a frog: (1) Rail section. (2) Drilling. (3) Angle or number of the frog. (4) Over-all length of the frog, also the distance from the point to the heel and the point to the toe. It should be stated whether these dimensions are given from the theoretical or from the working point. (5) If not a standard frog, give spreads between gage lines at heel and toe. (6) Width and depth of grooves, unless left to the judgment of the manufacturer. (7) If curved, give the curvature and also the hand (whether right or left hand). A frog is right or left-handed according as the turnout is to the right or the left of a man standing on the main track and facing the switch of the turnout. (8) The kind of frog wanted, whether plate-riveted, clamped, rigid bolted, spring, manganese rail-bound, or solid.

In conclusion it cannot be too strongly urged on the designing engineer to avoid anything special, for special and unusual material almost always means delay in the work, and additional expense.



KEEPING THE LINE OPEN IN WINTER

Thee Discussions of the Problems of this Season of the Year and Methods Adoped to Maintain Traffic

THE arrival of winter in the northern part of the United States and in Canada introduces problems of track maintenance of various kinds not encountered in summer. The more spectacular of these, as for instance the operation of snow plows, are frequently brought to notice, while such items as the shimming of tracks or the sweeping of switches are less frequently mentioned. The following articles deal with phases of winter maintenance of a special nature:

PROTECTING SWITCHES AND INTERLOCKING

By M. Burke

Roadmaster, Chicago, Milwaukee & St. Paul, Chicago, Ill.

It is very essential to make preparations for the handling of snow and ice at switches and interlocking plants in the fall before the ground is frozen. To this end track men are instructed to dig out the ballast between ties at all switches three inches below base of rail, from the head block to the heel of switch points and also at frogs and guard rails and around the clips on detector bars. This gives the man cleaning the switch a chance to push his shovel under base of rail and get the snow out easily without any picking, and greatly increases the efficiency of each man's work, as he can get the switch rods free for ready operation with very little delay.

A force of 30 extra men is kept on steadily during the winter months and is assigned to work at the switches just as soon as snow storms begin. These are experienced track men and are organized so that each man knows just where he belongs. When more men are needed an employment agency is called upon to send extra men.

When a snow storm approaches the men are distributed at all important points in the day time, and should the storm continue during the night another force is arranged for to relieve the day men and keep the work going continuously until the storm ceases. We furnish our men a regular meal at midnight while at this kind of work and let part of the men go at this time, so that we always have men at work on switches. These men are supplied with snow brooms with chisel ends on the handles, No. 2 track shovels and picks when necessary; but they do not have to use picks very often on account of ballast being dug out, as previously stated. On our main tracks we use a box car flanger that is operated by air from an engine and does good flanging on tracks without the aid of section men. After the snow storm ceases a work train is sent out and all the piled up snow is loaded into gondola cars and hauled away to unload on some high fill where it does not have to be handled again.

Interlocking plants where pipe lines are exposed give the most trouble in sleet storms. As the use of salt on pipe lines is not permitted because it results in corrosion of the pipes, men are placed in the towers to keep the pipe lines moving so that the sleet does not get frozen on them. A Hauck thawing outfit has been used very effectively and economically for this purpose, as one of these small outfits will accomplish the work of two laborers.

At the most important interlocking plant, at Western avenue, where the Chicago, Milwaukee & St. Paul separates from the Pittsburgh, Cincinnati, Chicago & St. Louis and crosses the Chicago & North Western, and where there are an average of 1,800 train movements in each 24 hours, the snow is handled with a force of 24 men in the heaviest snow storms. There are movable point frogs in this plant which have to be kept free from snow at all times so they will fit up properly to stock rails. This requires two men at each of these crossings, one man to take care of each set of movable frogs. At switch points in heavy storms two men are kept at each switch sweeping out snow with brooms after the heavy snow has been first shoveled out, and where ice and sleet accumulate on switch plates and switches the thawing outfit is used.

This plant is one of the most important in the city of Chicago. The North Western and the Pan Handle also each work a force of 25 to 30 men here in heavy

storms, as this is a joint crossing and each company takes care of its part of the plant.

There are several other crossings in the district where men are kept for protection, night and day, in snow storms. One of these has 800 train movements, another 700, and a third has 500 each 24 hours. These are all handled as outlined for the Western avenue plant.

WATER STATIONS IN WINTER

By A. M. Clough

Supervisor, New York Central, Batavia, N. Y.

All trackmen know that engine tanks are constantly being run over when taking water. This is bad enough in summer time, especially if proper drainage is not provided for this overflow, but doubly so in winter, when flooding the track and covering the water column with a coating of ice impairs the proper working of the water column and causes hours of hard work in cleaning out the tracks. It is also the cause of bad rail, so that engines in starting slip and burn depressions in the rail. No doubt a stringent rule on all roads forbids the flooding of tracks when engines are taking water, but trackmen know how far this rule is observed.

The only remedy available is to provide drainage for this overflow. On single or double tracks this is easily accomplished by wooden chutes or paved runways to the ditches on each side of the track, but in yards or on four-track roads deep and adequate drains must be constructed with flaring openings between the tracks to gather and carry off this water quickly to some proper outlet and with fall enough to insure that the drains will not clog with ice in winter time. Provision should be made to thaw them out in the event of their becoming frozen up, using a jet of steam from a nearby pumping station or from the work train engines or steam derrick usually a part of the division equipment. The self-draining water

Track Pan in Winter, Showing Ice Removed to Shoulder

columns with deep pits and adequate drainage have greatly lessened the water station trouble of former years.

In the case of track pans, where trains scoop water traveling at 45 miles per hour, and where a third of the water is wasted by being thrown out in a thin spray by the engine scoop, a real problem is encountered in keeping these installations open in zero weather. It is only by installing perfect drainage, putting the track on the best of stone ballast and using special ties, with tie plates on every tie, that these pans and the tracks can be maintained in perfect order all the year around. The advent of the pneumatic tie tamper has also done a lot to make their maintenance easier compared with the old-time hand tamping, but it is in winter that the real test of maintaining them comes, and the foreman who has one of those stations on his section or the supervisor who has two or three on his division must often use extreme effort to keep them open.

Track troughs are usually from 1,800 to 2,000 ft. long, 22 in. wide and 7 in. deep, and are filled to contain about 13,000 gal. of water. They are filled from 5 automatic intakes which will fill up the tank and shut off automatically in from 1½ to 2 min. after each train scoops water. A four-inch steam main leading from a battery of boilers at the pump house carries steam to the track pans through cross-pipes every 30 ft., and keeps the

Heavy Coat of Ice Between Tracks

water from freezing, no matter how cold it is. It is from these steam pipes that a great deal of the hardship comes. The removal of the water by a train bares the opening of the steam pipe in the pan, causing large clouds of steam to rise, and which together with the slippery ice conditions, makes it both dangerous and difficult for men to work around them. In addition, a warm steam pipe crossing the tracks every 30 ft. keeps that part of the track from freezing, and if the weather becomes severe enough to make the track heave it can be readily seen what would take place. During all freezing weather a depth of four inches of ice will form over the entire surface of the tracks in each 24 hours. There is no real remedy for this except to pick and shovel the ice from between the rails, and when thrown out on the shoulder or thrown on the adjacent track it can be removed by flangers and roadbed spreaders with a special wing for the purpose, but the major part of the work must still be done by manual labor.

A foreman and 20 men are necessary the most of the winter, who, when not engaged on the pan proper, remove the ice from the leaving end of the pans where the dripping from the train is carried out for one-fourth mile. The accompanying photographs, showing a typical track water pan 1,829 ft. long, indicate conditions during a mild spell after the ice had been removed from the track.

FIGHTING SNOW IN YARDS

By J. S. Robinson

Division Engineer, Chicago & North-Western, Chicago, Ill.

In the Chicago terminals of the Chicago & North-Western the system followed to secure the most effective snow and ice disposal during the winter is to prepare the yards in the fall by having the regular section men dig out the ballast between the ties at the switch and connecting rods to make a space under and around

them for snow and to enable the men to remove the snow quickly when it falls and to prevent ice from forming around the rods, thus preventing their moving.

The organization consists of from 10 to 25 regular section men in each yard, depending on the size, with only a section foreman over the smaller gangs and a foreman and assistant over the larger gangs. All these men are drilled in snow disposal and take care of ordinary snow falls. In case of heavy falls of snow, the roadmaster takes a station at some central point where he can keep in touch with the different yards by telephone and as soon as the foremen find that they cannot handle the snow, they call on him for extra men to help—from 10 to 50 men, as necessity demands. The extra men are sent from the points of assembly or from labor agencies, the points of assembly being buildings, dining and bunk houses, constructed for the purpose; dining and bunk cars, either on or off the trucks, located at central points, so the extra men do not have to walk over a half mile to the dining cars at meal time. Meals are furnished the extra men by the company, and consist of good, wholesome food, with plenty of hot coffee, and in case of very bad storms, hot coffee is carried to the men on the work at regular intervals, as same as water at other times.

When the extra men are sent to assist the regular gangs at night, they are divided into gangs of 10 men, put in charge of one of the regular men in the gang and sent to different parts of the yards. They first clean the ladder tracks with brooms, picks and shovels, piling the snow beyond the ladder paths, so that switchmen have free access to the switches. Paths are also cleaned a certain distance back of the frogs, where switchmen make the most frequent couplings in freight yards. In passenger yards, they clean the ladders, cross walks and walks between the tracks so that the steam, water, air, gas and sewer connections are accessible. Snow burners are used on switch and connecting rods and switch points, to burn off the coating of ice that forms on them, after the snow has been cleaned away, but only in daytime. They are not permitted at night on account of the glare, which prevents the men from seeing the approach of engines or cars, making them liable to serious personal injuries.

Work trains for gathering up the snow, except in extreme cases, are only employed in the daytime, on account of the liability of personal injuries.

A most important element in securing efficiency in an organization of this work is a central point with telephones radiating to important points in all yards, where the roadmaster or some other officer can keep in touch with the men, the train dispatchers, trainmasters and yardmasters at all times, to enable him to direct his work intelligently.

Annual Track Inspection Awards

A NUMBER of the roads which conduct annual track inspection have tabulated the markings for the different sections and roadmasters' districts and announced the ratings for each and the names of those receiving special recognition. The results of these inspections on several roads are given below:

The Lehigh Valley

The New York division of the Lehigh Valley, M. A. Mulligan, superintendent, and A. M. King, division engineer, received the highest rating as a result of the annual track inspection. The rating is made on a basis of 100 per cent, with 35 per cent each for line and surface and 6 per cent for ties. The remaining 24 per cent is made up of 6 per cent for anti-creepers, insulated joints and joint bolts grouped under one head, and equal amounts for ballast, drainage and general appearance. The rating obtained on the division was 96.98 per cent. The New Jersey & Lehigh division was given second place with a rating of 94.98.

The track of the New York division is in charge of Supervisor James Sheehan, who attained the highest rating among supervisors. The following supervisors received the highest ratings on their respective superintendents' divisions: H. F. Reilly, Wyoming division, 96.15 per cent, the second highest rating for a supervisor's section; J. D. Smith, New Jersey & Lehigh division, 95.5 per cent; M. J. Greeney, Buffalo division, 95.34 per cent, and P. M. Dinan, Seneca division, 94.61 per cent.

The Lackawanna

The results of the 1916 track inspection of the Delaware, Lackawanna & Western have been tabulated and the awards made under the following regulations: A section foreman who has taken first prize on his section for three consecutive years is paid extra compensation to the amount of $10 per month in addition to his regular monthly salary, the first prize being awarded to the foreman standing second and the second prize to the foreman standing third. This extra compensation is paid during the following year commencing January 1, and each year thereafter so long as the foreman maintains his section with the same efficiency. If he does not hold his section to the same high standard and drops back to a lower rating, the extra compensation is discontinued and he again enters the prize contest as before. Beginning in 1915 the annual prizes to section foremen have been awarded on high inspection rating and low cost of maintenance. As a result of this method, efficiency awards will be made to one foreman on eight of the ten roadmasters' divisions of the road during 1917 and to two foremen on another roadmaster's division, leaving but one division of the ten where this special award will not be made.

In the last award the west end of the Buffalo division, P. Quinlivan, roadmaster, received the highest rating for a roadmaster's division for the second consecutive year, 89.91 per cent. The east end of the Buffalo division, James Wynne, roadmaster, was rated second.

New York Central

The results of the annual track inspection of the New York Central which have recently been announced show the electric division, F. Boardman, division engineer, to have secured the highest rating on the main line division between New York and Buffalo. This division received an average rating of 83.1 per cent, with the Syracuse division, B. M. McDonald, division engineer, in the second place with a rating of 83 per cent. Sub-division No. 23, of the Syracuse division, A. M. Clough, supervisor, received the highest rating for a supervisor's section, with 83.4 per cent, while subdivision No. 3, of the Eastern division, M. E. Egan, supervisor, is in the second place for a supervisor's territory with a rating of 83.3 per cent. Section No. 2 of sub-division No. 23 of Syracuse division, John Sheridan,

foreman, received a rating of 84.9 per cent, the highest rating for a foreman's section. This is the fifth consecutive year that A. M. Clough, supervisor, and John Sheridan, foreman, have received the highest ratings respectively.

The 33 section foremen having the best track on their respective sub-divisions will receive premiums of $3 per month for the coming year, while the 9 foremen having the best sections on their respective superintendents' divisions will receive an additional premium of $2 per month, making their total $5 per month. Also 9 foremen on branch line sections each receive $2 per month for having the best branch line sections on their respective divisions, while 10 foremen of yard sections were awarded prizes of $3 per month because of the high standard of their work.

THE ROCK ISLAND

The Chicago, Rock Island & Pacific has awarded prizes of $100 to the following roadmasters, whose track has shown the greatest improvement on their respective divisions during the last year:

W. E. Haberlaw, Chicago Terminal and Illinois divisions, Rock Island Ill.
T. H. O'Brien, Iowa division, Des Moines, Iowa.
T. W. Brown, Missouri division, Dows, Iowa.
G. Tjaden, Cedar Rapids and Minnesota divisions, Iowa Falls, Iowa.
J. W. Petersen, Dakota division, Estherville, Iowa.
C. C. Flynn, Des Moines Valley division, Des Moines, Iowa.
W. E. Brown, Nebraska division, Fairbury, Neb.
J. D. Sullivan, Colorado division, Colorado Springs, Colo.
D. B. Griffin, Arkansas division, Little Rock, Ark.
G. H. Carpenter, Louisiana division, El Dorado, Ark.
J. A. Trainer, Indian Territory division, Haileyville, Okla.
W. H. Gruhlkey, Pan Handle and Amarillo division, Amarillo, Texas.
J. H. Logan, El Paso division, Pratt, Kan.
V. B. Simpson, St. Louis division, Eldon, Mo.
J. O'Connor, Oklahoma and Southern divisions, Fort Worth, Texas.
W. A. Simpson, Kansas division, Armourdale, Kan.

The section foreman on each roadmaster's district whose track showed the greatest improvement was also awarded a prize of $50. Fifty-one section foremen received this recognition.

CANADIAN PACIFIC

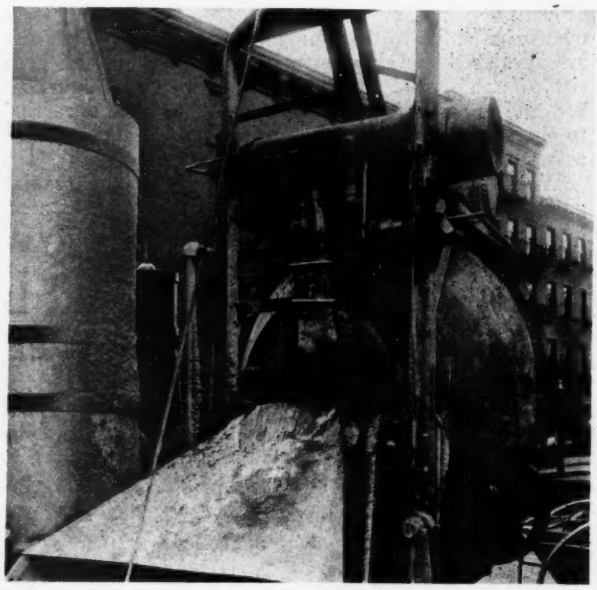
The Canadian Pacific has awarded 62 prizes to section foremen on its lines. These include the general manager's prize to the foreman having done the best season's work on the eastern lines, 4 to the foremen on the general superintendents' districts who have done the best work on their respective territories, 14 similarly awarded to the division superintendents' territories and 43 to individual foremen on each roadmaster's territory. No one foreman can win more than one prize.

The award is based on the quality of the work throughout the season, consideration being given to the amount of regular and extra labor expended, the amount of material inserted and the improvements effected, but the actual physical condition at the end of the season is not the sole determining factor. Before the close of the season a section is picked out as the most deserving in the point of work done on each roadmaster's territory. These sections on each division are inspected by the division superintendent and the division engineer who select the best one on each division for inspection by the general superintendent and the district engineer. These officers then select a section which they consider eligible for the general manager's prize, which is awarded personally after inspection by the general manager, the engineer maintenance of way, the assistant engineer maintenance of way and the district officers.

HEATING CONCRETE IN THE MIXER

THE heating of concrete materials during cold weather is a necessary and generally accepted practice, but, as ordinarily carried out, it is expensive, not only because of the heat lost through radiation, but also on account of the interference with the efficient conduct of the work which results from the measures taken to heat the materials. There is also considerable controversy as to the proper method for applying the heat, between those who advocate the injection of live steam directly into the material and those who prefer dry heating.

Because of these considerations considerable interest is attached to the introduction of a method for heating the concrete materials in the mixer during the process of mixing. This is accomplished by a blast flame obtained by the burning of fuel oil or kerosene with compressed air in a burner attached to the mixer, and in a manner that causes the flame to be blown into the drum.



MIXER EQUIPPED WITH HEATING ATTACHMENT

The device is known as the Hauck Concrete Heater, and is made by the Hauck Manufacturing Company, Brooklyn, N. Y. The burner consists of a steel pipe having an elliptical cross section with a short bend on the lower end to direct the flame diagonally into the drum. The burner is provided with connections to a 20 or 25-gal. oil storage tank, and to a source for compressed air. The storage tank is placed on top of the mixer, or wherever convenient, and where there is no supply of compressed air the storage tank is equipped with a hand pump to provide air at the required pressure. The burner equipped for compressed air supply can be started immediately and with the air pump a start can be made within five minutes. The approximate oil consumption is 1½ gal. per hour.

Heaters of this kind were used successfully by one of the subway contractors in New York City during the winter of 1915-1916, the method of heating proving entirely satisfactory to the inspectors. Among the advantages claimed for this device are the economy in heating and the ability to vary the temperature as desired. In tests it is said that a ½-cu. yd. batch was heated to 50 deg. F. in 2 min., to 60 deg. in 3 min. and 80 deg. in 4 min., the outside temperature ranging from 8 to 11 deg.

MODIFIED TYPE OF BANK REVETMENT

The Wabash Has Developed a Form of Protection Made of Wire Fabrics and Used Recently on the Missouri

DURING the past year the Missouri river has caused the railroads in the territory between Kansas City and Jefferson City a great deal of trouble. The means commonly employed to stop the rapid erosion of the banks failed in several places, and it was necessary to devise new methods, one of which is described here.

Early in March, 1916, the Wabash, which follows the north bank of the river from Kansas City east, had a great deal of trouble at a point known as Missouri City, where the track had been moved four times to escape the attacks of the river. After the last retreat, which it was thought would be the final one, the river renewed its attacks with increasing vigor and in a short time came dangerously near to the revised location of the line.

BUILDING THE MAT ON THE BARGE

A new method of bank protection had been tried previously by the Wabash on permanent river bank work, and in this emergency a modification of this permanent work was used with success at this particularly dangerous spot. This same method was used by the Missouri Pacific shortly afterward on a very much larger scale and at an equally dangerous point.

THE NEW BANK PROTECTION

The new bank protection consists of a form of mattress patented by A. O. Cunningham, chief engineer of the Wabash, to take the place of the United States Government standard willow mattress revetment, commonly used on this part of the Missouri river. The latter consists of a fabric of woven willows, tied together and reinforced by longitudinal and transverse lines of cables, about 20 feet apart, both above and below the mat. The construction is secured to the river bank by cables attached to dead men, and is sunk to the river bottom by weighting it with rock. The bank is commonly graded to a uniform slope and paved with rock to an elevation above the high water line.

The Cunningham mattress consists of two continuous sheets of wire fabric made by sewing together the strips of wire mesh as obtained on the market in rolls. These two sheets of fabric are placed one upon the other with a layer of rock and willow brush between. The entire structure is made secure by tying the two fabrics together through the filling at intervals of two feet both longitudinally and transversely. The portions of the mat above and below the water level are of necessity constructed by different methods and differ also in that the brush is omitted in the portion above the water line and, instead of single rocks at intervals, a solid pavement of rock is provided to a thickness of about 9 in.

The construction of the portion of the mattress to be submerged follows the general method employed in the willow mat revetment in that the mattress is fabricated on a barge from which it is launched and sunk as its construction progresses. The barge works on the down-stream edge of the mattress, moving down stream as the mattress is completed. In this case the deck of the barge is armored with steel rails or skids extending beyond the upstream side of the barge and curving down to the water's surface in the form of fingers. Along the down-stream side of the barge stands are provided for the mounting of 14 reels of wire mesh, which are obtained in widths of 58 in. and lengths of 300 ft. The mesh is unrolled from these reels and tied and stitched together to make a continuous web, the strips being laid, of course, parallel with the river. As soon as the section of the fabric occupying the space on the deck of the barge is completed it is loaded with a layer of rock and brush to an average depth of 9 in. and is then covered with the upper wire fabric. This consists of strips of wire mesh running at right angles to the direction of the flow of the river, the mesh being cut into lengths equal to the combined width of the submerged and bank mattresses. This upper fabric is sewed together exactly the same as the lower fabric to which it is tied through the brush and rock.

EMERGENCY MATTRESS SETTLING INTO THE RIVER

The mattress may be launched by various means. One method is to pull the barge away from the mattress by means of a hand capstan hauling on a 1½-in. line tied to a dead man or tree on the bank at some convenient point downstream. The mattress is, of course, anchored at its upstream end to dead men placed in the bank.

The portion of the mattress built above the water line is placed on the bank which has previously been graded to a uniform slope. The Wabash specifications provide

for a slope of 2½ to 1, which is obtained by the hydraulic method commonly used in river bank protection on the Missouri. The water is supplied by pumps on a barge from which a line of hose is run onto the bank.

The construction of the mattress on this uniform slope is identical with the portion in the water except that it can be accomplished much easier. The rolls of wire mesh are laid out parallel with the river bank sewed together and covered with an average of 9 in. of riprap. This is then covered with the ends of the transverse strips of wire mesh which had been previously cut and sewed to the portion of the mat made on the barge.

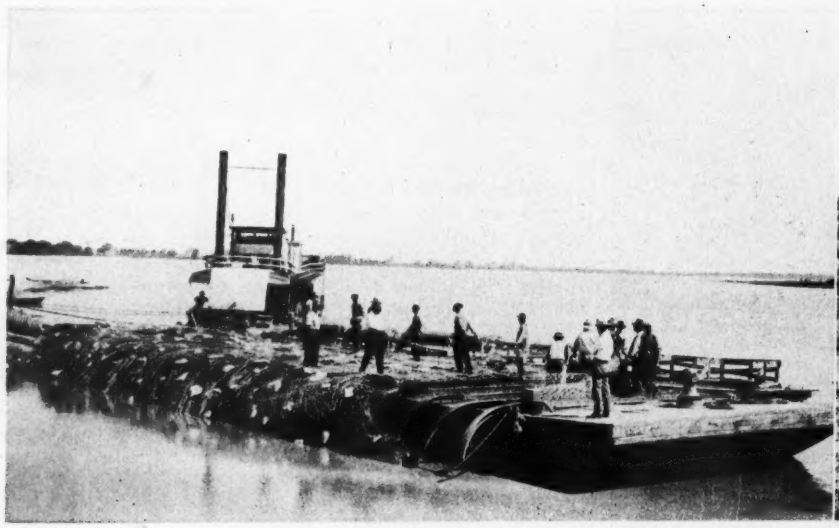
The completed mattress is anchored to the bank by dead men placed 16½ ft. center to center along the top of the bank, 10 ft. beyond the shore edge of the mattress. As in the willow mattress revetment, use is also made of quarry spalls which are poured into the voids between the stones above the water line and have the effect of making the pavement more secure against erosion.

The Wabash adopted this form of bank protection after several ineffectual attempts to use the willow mattress revetment. It has happened that this railroad's difficulties with the Missouri river generally come at times of high water when it is impracticable to construct a willow mattress. With the strong current prevailing at such time there is always danger that the mattress will be destroyed while being woven or sunk. The wire mattress can be put into any stage of water because of its strength, and up to the present has not been destroyed by the action of the water. It has also shown itself to be adaptable to emergency construction.

THE EMERGENCY MATTRESS

The application of this mattress to the emergency work consisted in the construction of a mattress substantially in the form used for permanent work on the top of the bank as close to the steep cutting bank as it was safe to permit the men to work. The fabric in this case consisted of American Steel & Wire Company triangular mesh No. 6 sewed together with No. 12 wire. This mattress was made in relatively narrow strips for as long a distance along the bank as possible. This strip was then reinforced as rapidly as conditions permitted by another laid along side of it farther away from the river, the two being securely connected. As the river continued to cut the bank the outer edge of the mattress was undermined with the result that the mattress would hang down over the edge of the cutting bank, reach the water surface, and as this process continued eventually become submerged a sufficient amount to protect the face of the embankment from the eroding action of the water. This temporary protection took care of the condition until the river fell and the permanent construction could be put in.

This method worked so satisfactorily to the Wabash that the Missouri Pacific, when put in a similar position at Wellington, Mo., on the right bank, adopted the same plan, but applied it on a much larger scale, using a very much larger amount of the material. In the spring of 1915 the Missouri river made a short cut just above Wellington, Mo., the effect of which was greatly to increase its velocity, causing serious bank cutting at certain points just below Wellington. The method usually employed in such cases consists in making fascines or bundles of brush with rock in them, tied together with cables and thrown into the water at the point of most serious cutting, supplemented by the use of pole mats thrown over the edge of the bank. This proved ineffective in this case. The method originated on the Wabash was used here for over 3,500 ft. of bank, at a cost to the Missouri Pacific, with the other temporary measures, of about $35,000. The railroad used in the emergency any kind of fencing wire that could be obtained and all manner of brush until the mat was completed and well anchored upon the bank. Under the conditions encountered it was necessary to build the mat over 100 ft. wide in one place, over 80 ft. of it being in the water.



THE MATTRESS BARGE

TWISTING THE TIES

When the river fell to a stage where permanent work could be employed it was found that the river had changed its channel. In consequence it may be several years before permanent work will be required at this point and at such time lasting construction can be effected with the use of this temporary mat where it is far enough in the river, by taking the mat apart as it lies on the bank above the water line, replace the brush with rock and put the mat back upon the bank after grading to a satisfactory slope. This will, in effect, give the same bank protection that the Wabash has perfected in its territory.

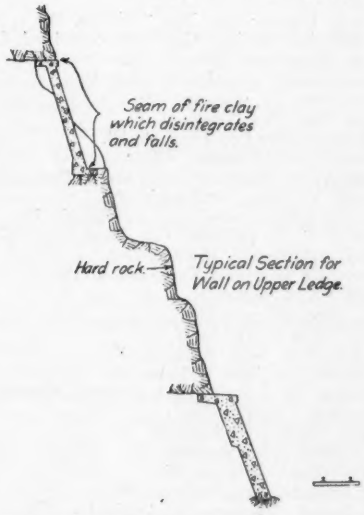
There has been considerable discussion as to whether the galvanized wire used in this form of mattress will stand the eroding and rusting action to which it will be

subjected, particularly near the water line. It is contended by those who have had long experience in river work that the grinding action of the sand in the water will rapidly remove the galvanizing from the steel wire, thereby leaving the wire exposed to rusting action. Time, of course, can only make sure of this. The fact remains, that in most cases where the mattresses are once sunk and the paving well done it matters little whether the wire lasts or not, as the silting action of the river covers the mattress up. Also in many cases after a railroad has fought the river at enormous expense, the river changes its channel and the type of mattress and whether it rusts or erodes or not is of no importance.

The Kansas City Bridge Company was the contractor for developing these types of mattress, both permanent and emergency, for the Wabash. We are indebted for the above information to A. C. Everham, terminal engineer for the Union Pacific, who was engineer of construction for the Kansas City Bridge Company at the time that the work was in progress.

AN UNUSUAL SLOPE PROTECTION PROBLEM

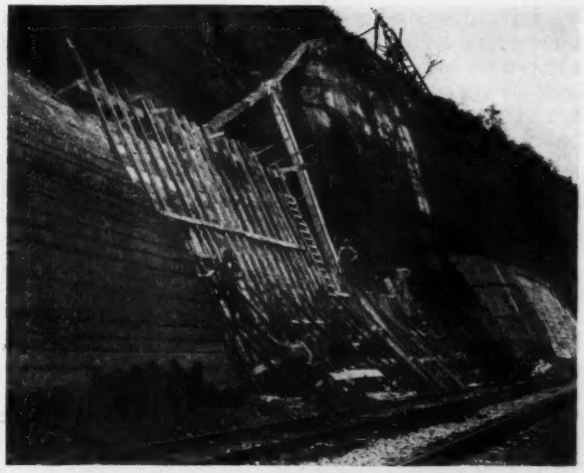
AN unusual problem in slope protection has recently been solved in an interesting manner by the Pennsylvania Lines West, at a point on the main line of the Southwest System, a short distance west of the station at Pittsburgh. At this point the line is located along the



SECTION SHOWING THE LOCATION OF WALLS

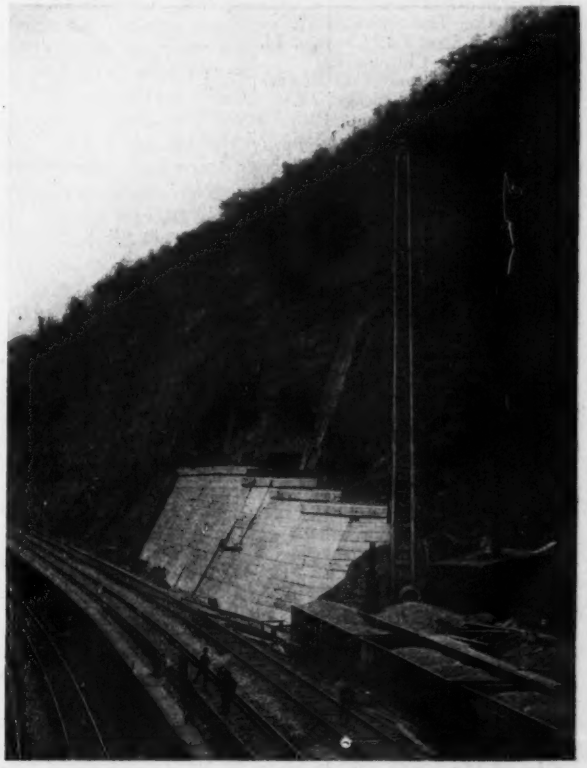
foot of Mt. Washington for a distance of about two miles, with the slope rising abruptly to a height of about 350 ft. About 16 years ago two additional tracks were added, at which time the foot of the slope was cut away at some places and concrete retaining walls were built at a few points, this being the first concrete placed on this division. The slope consists of strata of hard rock underlaid with a stratum of fire clay and shale about 35 ft. thick near the foot of the hill and another one about 20 ft. thick 50 ft. higher. These softer strata weather and disintegrate rapidly, the material falling down the slope onto the tracks below and leaving the rock overhanging. The disintegration is hastened at certain points by springs and by water draining over the face of the slope.

As the expense of sloping the hillside further was so great it was decided to stop the disintegration by the construction of concrete facing walls, as an extension of



FORM WORK AND CONCRETE SPOUTS

the existing walls on the face of the lower stratum and as a new wall at the upper level. These walls were designed as facing rather than retaining walls and their thickness varied from 2 to 8 ft. The outer face of the lower wall was built on a batter of 3 in. in 5 in. to join the face of the overhanging ledge while the batter on the face of the upper wall was 1 in. in 3 in. Gravel was used as the aggregate for the concrete; the mixture for a depth of 3 ft. from the face of the wall consisting of one part cement, three parts sand and six parts washed gravel. Where it was necessary to build the wall of additional thickness to connect with the stratum behind, large stones were used with the voids filled with a mixture of one part of cement, three parts of sand and



VIEW SHOWING COMPLETED LOWER WALL

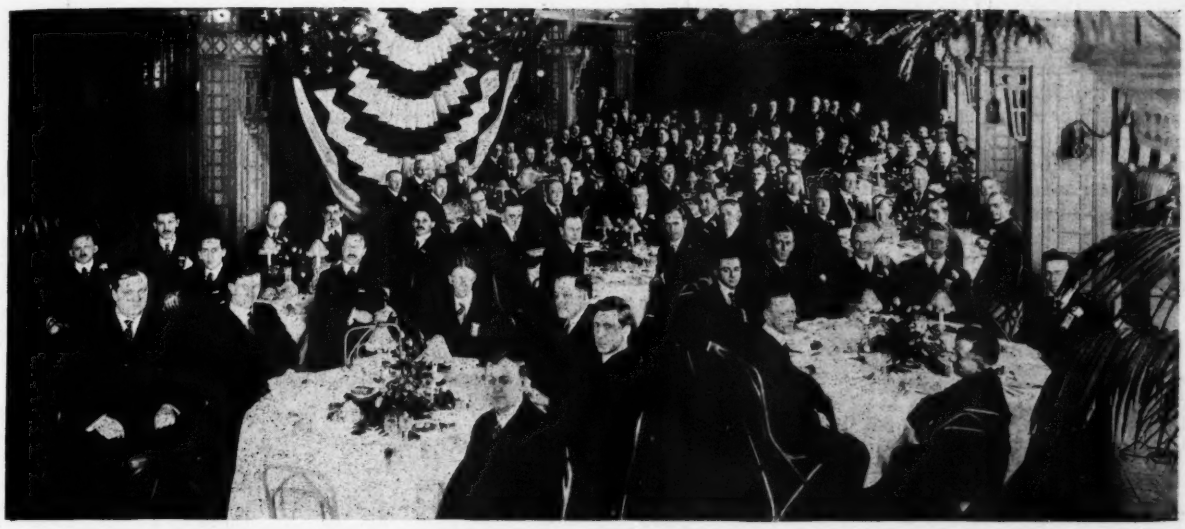
ten parts of washed gravel. The lower wall extended to a minimum depth of 4 ft. below the base of rail of the adjacent track. Special drainage was provided in the back fill with a sewer pipe installed wherever water seeped out of the back. Weep holes about 6 in. square were built at intervals of 10 ft.

As the steel tower and the bucket ordered for this work were not received in time the concrete was placed by means of a tram track built of old form lumber on the face of the slope. A 1½ cu. yd. bucket made of two-inch planks and lined with tin secured from old car roofs was mounted on sled runners and was used with wooden troughs 12 in. wide to spout the concrete into place. Approximately 2,300 cu. yd. of concrete were placed at a cost of about $6 per cu. yd.

N. R. A. A. MEMBERSHIP LIST

The following is the list of members of the National Railway Appliances Association, which will hold its annual exhibit of devices and materials used in railway maintenance of way and signaling, March 19 to 22, in the Coliseum, Chicago:

Adams Motor & Mfg. Co., Chicago, Ill.
Adams & Westlake Co., The, Chicago, Ill.
A. G. A. Railway Light & Signal Co., Elizabeth, N. J.
Ajax Rail Anchor Co., Chicago, Ill.
Alger Supply Co., Chicago, Ill.
American Guard Rail Fastener Co., Philadelphia, Pa.
American Hoist & Derrick Co., St. Paul, Minn.
American Steel & Wire Co., Chicago, Ill.
American Kron Scale Co., New York, N. Y.
American Valve & Meter Co., The, Cincinnati, Ohio.
American Vulcanized Fibre Co., Pittsburgh, Pa.
Anchor Co., The, Chicago, Ill.
Armco Iron Culvert Manufacturers' Assn., Middletown, Ohio.
Asphalt Ready Roofing Co., New York, N. Y.
Associated Manufacturers of Malleable Iron, Cleveland, Ohio.
Automatic Electric Co., Chicago, Ill.
Ayer & Lord Tie Co., Chicago, Ill.
American Railway Bridge & Building Assn., Chicago, Ill.
Barrett Co., The, Chicago, Ill.
Bethlehem Steel Co., Chicago, Ill.
Boss Nut Co., Chicago, Ill.
Brach, L. S., Supply Co., Newark, N. J.
Bryant Zinc Co., Chicago, Ill.
Buda Co., The, Chicago, Ill.
Carbic Mfg. Co., Duluth, Minn.
Carborundum Co., Niagara Falls, N. Y.
Carnegie Steel Co., Pittsburgh, Pa.
Cast Iron Pipe Assn., Chicago, Ill.
Chicago Bridge & Iron Works, Chicago, Ill.
Chicago Flag & Decorating Co., The, Chicago, Ill.
Chicago Malleable Castings Co., Chicago, Ill.
Chicago Pneumatic Tool Co., Chicago, Ill.
Chicago Railway Signal & Supply Co., Chicago., Ill.
Cleveland Frog & Crossing Co., Cleveland, Ohio.
Corning Glass Works, Corning, N. Y.
Crear, Adams & Co., Chicago, Ill.
Creepcheck Co., Inc., The, New York, N. Y.
D. & A. Post Mold Co., Three Rivers, Mich.
Detroit Graphite Co., Chicago, Ill.
Dickinson, Inc., Paul, Chicago, Ill.
Dilworth, Porter & Co., Ltd., Pittsburgh, Pa.
Dixon Crucible Co., Joseph, Jersey City, N. J.
Duff Mfg. Co., The, Chicago, Ill.
Edison Storage Battery Co., Orange, N. J.
Edison, Thos. A., Inc., Bloomfield, N. J.
Electric Railway Improvement Co., The, Cleveland, Ohio.
Electric Storage Battery Co., Philadelphia, Pa.
Elyria Iron & Steel Co., The, Cleveland, Ohio.
Engineering News, New York. N. Y.
Eymon Continuous Crossing Co., The, Marion, Ohio.
Fairbanks, Morse & Co., Chicago, Ill.
Fairmont Gas Engine & Railway Motor Car Co., Fairmont, Minn.
Federal Signal Co., Albany, N. Y.
Fowler Electrical Supply Co., The, Toledo, Ohio.
Fibre Conduit Co., The, Chicago, Ill.
Frictionless Rail, The, Boston, Mass.
General Electric Co., Schenectady, N. Y.
General Railway Signal Co., Rochester, N. Y.
Gurley, W. & L. E., Troy, N. Y.
Hall Switch & Signal Co., New York, N. Y.
Hatfield Rail Joint Mfg. Co., The, Macon, Ga.
Hayes Track Appliance Co., Richmond, Ind.
Hazard Mfg. Co., Chicago, Ill.
Hoeschen Mfg. Co., Omaha, Neb.
Hubbard & Co., Pittsburgh, Pa.
Hyatt Roller Bearing Co., Newark, N. J.
International Steel Tie Co., The, Cleveland, Ohio.
Ingersoll-Rand Co., New York, N. Y.
Jennison Wright Co., Toledo, Ohio.
Johns-Manville Co., H. W., New York, N. Y.
Jordan Co., O. F., The, East Chicago, Ind.
Joyce-Cridland Co., The, Dayton, Ohio.
Julian-Beggs Signal Co., Madison, Wis.
Kalamazoo Railway Supply Co., Kalamazoo, Mich.
Kellogg Switchboard & Supply Co., Chicago, Ill.
Kelly-Derby Co., Inc., The, Chicago, Ill.
Keppler Glass Constructions, Inc., New York, N. Y.
Kerite Insulated Wire & Cable Co., Inc., New York, N. Y.
Keuffel & Esser Co., Chicago, Ill.
Keystone Grinder & Mfg. Co., Chicago, Ill.
Kilbourne & Jacobs Mfg. Co., The, Columbus, Ohio.
Lufkin Rule Co., The, Saginaw, Mich.
Lehon Co., The, Chicago, Ill.
Lackawanna Steel Co., Lackawanna, N. Y.
Louisiana Red Cypress Co., New Orleans, La.
MacRae's Blue Book Co., Chicago, Ill.
Madden Co., The, Chicago, Ill.
Massey Co., C. F., Chicago, Ill.
Miller Train Control Corporation, Danville, Ill.
Morden Frog & Crossing Works, Chicago, Ill.
Mudge & Co., Chicago, Ill.
M. W. Supply Co., Philadelphia, Pa.
National Carbon Co., Cleveland, Ohio.
National Concrete Machinery Co., Madison, Wis.
National Indicator Co., Long Island City, N. Y.
National Lead Co., Chicago, Ill
National Lock Washer Co., The, Chicago, Ill.
National Malleable Castings Co., The, Cleveland, Ohio.
Nichols, Geo. P. & Bro., Chicago, Ill.
Northwestern Motor Co., Eau Claire, Wis.
Ogle Construction Co., Chicago, Ill.
Okonite Co., The, New York, N. Y.
O'Malley Beare Valve Co., Chicago, Ill.
Otley Paint Mfg. Co., Chicago, Ill.
Page Woven Wire Fence Co., Monessen, Pa.
Patterson, W. W., Co., Pittsburgh, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Pocket List of R. R. Officials, The, New York, N. Y.
Positive Rail Anchor Co., Marion, Ind.
Protective Signal Mfg. Co., The, Chicago, Ill.
Pyrene Mfg. Co., Chicago, Ill.
P. & M. Co., The, Chicago, Ill.
Q. & C. Co., New York, N. Y.
Rail Joint Co., The, New York, N. Y.
Railroad Supply Co., The, Chicago, Ill.
Railway Motor Car Company of America, Chicago, Ill.
Railway Review, Chicago, Ill.
Ramapo Iron Works, Hillburn, N. Y.
Reading Specialties Co., Reading, Pa.
Roadmasters' Assn., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.
Safe Lock Switch Machine Co., Lexington, Ky.
Searchlight Co., Chicago, Ill.
Sellers Mfg. Co., Chicago, Ill.
Signal Accessories Co., Chicago, Ill.
Simmen Automatic Railway Signal Co., Buffalo, N. Y.
Simmons-Boardman Publishing Co., Chicago, Ill.
Snow Construction Co., T. W., Chicago, Ill.
Southern Pine Association, New Orleans, La.
Squire-Cogswell Co., Chicago, Ill.
Standard Asphalt & Rubber Co., Chicago, Ill.
Templeton-Kenly & Co., Ltd., Chicago, Ill.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
Toledo Scale Co., Toledo, Ohio.
Track Specialties Co., New York, N. Y.
Tyler Underground Heating System, Pittsburgh, Pa.
Union Switch & Signal Co., Swissvale, Pa.
U. S. Wind Engine & Pump Co., Batavia, Ill.
Verona Tool Works, Chicago, Ill.
Volkhardt Co., Inc., Stapleton, N. Y.
Waterbury Battery Co., The, Waterbury, Conn.
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.
Western Electric Co., Inc., New York, N. Y.
Wharton, Wm. Jr., & Co., Inc., Easton, Pa.
Wyoming Shovel Works, The, Wyoming, Pa.
Yale & Towne Mfg. Co., The, New York, N. Y.



Annual Banquet of the Wood Preservers' Association

AMERICAN WOOD PRESERVERS' CONVENTION

The Report of the 13th Annual Meeting, Held In New York, Including Abstracts of Papers and Discussions

THE thirteenth annual meeting of the American Wood Preservers' Association was held at the Hotel Astor, New York, on Tuesday, Wednesday and Thursday, January 23, 24 and 25, respectively. Approximately 125 members were present.

The officers of this association during the past year were: President, Carl G. Crawford, general manager American Creosoting Company, Louisville, Ky.; first vice-president, John Foley, forester Pennsylvania Railroad, Philadelphia, Pa.; second vice-president, M. K. Trumbull, vice-president National Lumber & Creosoting Company, Kansas City, Mo.; secretary-treasurer, F. J. Angier, superintendent of timber preservation Baltimore & Ohio, Baltimore, Md.

The convention was called to order by President Crawford at 10 o'clock Tuesday morning. In his opening address Mr. Crawford reviewed briefly the history of the organization since its inception at an informal gathering of a few timber-treating men at Perth Amboy, N. J., in 1904 and its first convention in New Orleans in January, 1905. He laid special emphasis on the necessity of laying aside the spirit of commercialism in the work of the association and subordinating individual interests to those of timber preservation as an industry. He also urged the continued co-operation of those men in railway service. In concluding, he called attention to the recent action of several national engineering associations interested in wood preservation in which they voted to accept as their standards the recommendations and conclusions of the American Wood Preservers' Association.

The report of the secretary-treasurer showed a net gain in membership during the year of 24 and a total membership of 300, 79 of whom are connected with 37 railroads. A balance of $476 was reported in the treasury.

SERVICE TESTS

A systematic collection, compilation and tabulation of data of this character has been undertaken by the Forest Products Laboratory in co-operation with this committee and the committee on Wood Preservation of the American Railway Engineering Association. A detailed analysis of the data secured was made by R. H. Hicks, engineer in forest products, Forest Products Laboratory, Madison, Wis. The statistics comprise 872 records on 61 species, of which 53 were completed.

In compiling these data, letters were sent to all railroad companies known to have service-test records and to many others. The greater part of the accompanying records are from reports of actual test tracks.

Forty completed records are given for 18 untreated species on 5 railroads, 7 for 4 Burnettized species on 3 lines, and 6 for 5 species treated by 3 other methods. Of the latter, beech, red oak, and loblolly pine treated by Long's liquid and placed on the Illinois Central in Mississippi had an average life of 4¼, 4¾ and 5½ years, respectively, which indicates this preservative was not a success. The same is true of the red oak ties treated with creosol-calcium, the average life being but 4 years.

The average life of 1,095 southern yellow pine ties treated with zinc-creosote (process not stated) was 15.6 years, while 16 tupelo gum ties treated in the same way lasted but 8.5 years on the G. H. & S. A. Forty-five Burnettized red gum ties placed by this company averaged 6 to 7 years. Two groups of 67 and 68 longleaf pine Burnettized ties averaged 14.8 and 14.4 years, coast Douglas fir 10 to 11 years, and southern sap pine 5.4 and 5.7 years, all of which were treated with zinc chloride and placed in the tracks of the N. Y., N. H. & H., the S. P. and the G. H. & S. A., respectively.

The Douglas fir was divided where possible into the true coast fir and that grown in the Rocky mountains. The average life of 100 unseasoned coast fir ties laid with cut spikes without tie plates was 7.5 years, although the 557 green ties in the track laid with various fastenings gave an average life of 8.3, as compared with 8.4 years for 1,078 seasoned ties in the same location. The average life of 570 green mountain fir ties in another location was 7.6 years compared with 7.7 years for 571 seasoned ties. A direct comparison of the coast and moun-

tain varieties cannot be made, however, on account of climatic conditions. The coast fir was laid in a much more favorable location compared with that of the mountain variety.

The following figures, submitted by J. H. Waterman of the C. B. & Q., summarize the various treatments by species, and are an average of the conditions on 20 divisions of this railway in the states of Wisconsin, Illinois, Missouri, Iowa, Nebraska, Colorado, South Dakota and Wyoming. These ties were set in 1909, also 1910, which fact should be kept in mind in analyzing the tables. A general summary, regardless of species, follows:

Process	Total Placed	Total Removed to Jan., 1917	Per Cent Removed to Jan., 1917
Straight creosote	3,264	16	½
Card	15,817	455	3
Burnett	2,488	100	4
Untreated	3,270	2,626	80

DISCUSSION

A. R. Joyce (Joyce-Watkins Company) described the results of inspections of several installations of treated ties on a western road. A detailed examination of 2 miles of a 14-mile installation of zinc-treated ties laid in gravel ballast under 75-lb. rail with tie plates on curves only in western Nebraska in 1900 showed 93 per cent of the ties still in track after 16 years' service. It is estimated that at least 50 per cent of these ties will last 20 years. Adjoining this section 6 miles of untreated fir ties were placed at the same time. These ties began to come out because of decay in 1905 and all had been removed by 1908. These ties were in a region with 19 in. annual rainfall.

On another line 90 miles long, built by the same road in 1906, zinc-treated fir and pine ties were used with tie plates on the curves only. The total renewals for all causes on this line during the 10 years since its construction aggregate only 600 ties. The normal life of this class of ties untreated in this vicinity is 6 years.

THE GROUPING OF TIES FOR TREATMENT

BY CARLILE P. WINSLOW
Assistant Director, Forest Products Laboratory, Madison, Wis.

In its broader aspects, the proper grouping of ties for treatment is dependent upon a variety of variables. Aside from the inherent variations of individual species, we must contend with variations in moisture content, the proportion of heartwood and sapwood, the form of the ties, the character of treatment desired, and the character or kind of preservative used. According to the combination of such variables that may exist at a given plant at a given period or season, will be determined the grouping best suited for its needs. But the underlying and governing factors are the inherent differences in susceptibility to treatment of the individual species.

It should be kept clearly in mind that any general grouping based entirely on the species is entirely impractical. The striking difference in the susceptibility to treatment of the heartwood and sapwood of nearly all species is so generally recognized that it scarcely needs comment; the innumerable combinations of relative proportions of heart and sap which may exist in individual ties is equally well known. The problem is, therefore, of a dual nature: first, a consideration of the relative ease of treatment of the sapwood and heartwood of different species, and secondly, a classification according to the form of ties it may be desired to group for treatment at a given time and place.

In order to present even the most general grouping of ties for treatment, some classification must be adopted. Innumerable classifications might, of course, be drafted, but the following will serve the purpose:

Class 1. Ties showing no heart on any face.
Class 2. Ties showing no sap on any face.
Class 3. Heart face ties with not less than 80 per cent heartwood.
Class 4. Heart face ties with not over 20 per cent heartwood.
Class 5. Other ties not falling in any of the foregoing classes.

To accompany the foregoing classification, the following grouping is presented as generally indicative of the relative ease of treatment of the different species used for ties. The species in each group are listed alphabetically, and the groups are listed in order of ease of treatment:

HARDWOODS

GROUP 1.—SAPWOOD. All species listed below are reasonably susceptible to treatment.

GROUP 2.—HEARTWOOD. Ash, white; ash, green; basswood; beech (white heart); birch; cherry, wild; elm, slippery; elm, white; gum, tupelo; oak, red; oak, chestnut.

GROUP 3.—HEARTWOOD. Aspen, largetooth; elm, rock; hickory, mockernut; maple, silver; maple, sugar; sycamore

GROUP 4.—HEARTWOOD. Beech, red heart; chestnut; oak, white; oak, burr; gum, red.

SOFTWOODS

GROUP 1.—SAPWOOD. All species listed below easy to impregnate with the exception of alpine fir, white fir, white spruce, hemlock (eastern and western). These are considered further in Group 4 below.

GROUP 2.—HEARTWOOD. Pine, jack; pine, loblolly; pine, longleaf; pine, Norway; pine, shortleaf; pine, spruce; pine, western yellow.

GROUP 3.—HEARTWOOD.* Pine, lodgepole; fir, Douglas (coast); spruce, Englemann.

GROUP 4.—HEARTWOOD. Cedar, cypress; †fir, Alpine; fir, Douglas (mountain); †fir, white; ‡hemlock, eastern and western; larch, western; tamarack; ‡spruce, white.

SPECIFICATIONS FOR THE PURCHASE AND PRESERVATION OF TREATABLE TIMBER

FUNDAMENTAL PRINCIPLES

Only perfectly sound timber should be treated. Decay, even when not very noticeable, may greatly reduce the strength value, and hence, with species which decay rapidly, but short service may result in a decided weakening.

In order to obtain the best results properly seasoned material should be used. Whenever conditions will permit, thoroughly air season all structural timber, track ties, piles and other materials before treatment. So far as practical arrange delivery of material so that the seasoning period may be during seasons of minimum rainfall and humidity. Pile incoming material in its proper groups or classes, separating green from seasoned or partially seasoned material, and using successive portions of the yard for the storing of green timber. The seasoning yard should be in the open, where the prevailing winds will strike it freely; it should not be in a low and humid situation of any kind if it can be avoided, should have good drainage, and should be kept free from weeds, grass and decaying wood material. All outer bark should be removed before treatment, and in most cases before seasoning. Also as much of the inner bark should be removed as practical, and in no case should over 10 per cent or strips over 1 in. wide and 6 in. long be left. When there is not sufficient time for proper air seasoning, or, in the case of piling and large dimension tim-

*Some question as to whether the lodgepole pine and Englemann spruce should not be included in Group 2 and the Douglas fir in Group 4.
†Includes sapwood.
‡No real distinction between heart and sap.

bers which will not air season successfully throughout without deterioration, artificial seasoning by steaming or boiling before treatment must be resorted to.

A good preservative is essential to long life. From the standpoint of permanence and protection of wood against decay and marine borers, coal-tar creosote is the best available preservative for general purposes. Zinc chloride deserves full consideration in regions of low precipitation, in dry situations, and where low first cost is essential. While the life of zinc-treated material is usually less than that of creosoted, the expense is also less, and the relation of cost to service is an important consideration.

Proper injection as to quantity and penetration is essential. In treating with creosote, it is recommended that a maximum injection of creosote sufficient to insure the penetration of all treatable wood be required. All of the sapwood and as much of the heartwood as is possible for the particular species shall be thoroughly impregnated. This applies equally to full-cell and empty-cell treatments. In treating with zinc chloride it is essential that all timber be treated to refusal.

Proper subsequent handling of timber is essential. Wherever possible, all timber should be framed before treatment, and in lieu of this, unimpregnated wood exposed by framing after treatment should be thoroughly painted with hot creosote. To secure the best results it is necessary to protect treated material from mechanical abrasion both in handling and under service conditions.

Accurate records as to the life and cost of treated material are essential. It has been the general experience that most satisfactory results are secured by maintenance of a limited number of intensive records of representative sections. Two methods are in use for determining the annual costs of both treated and untreated materials. One of these is the well-known amortization method, which involves the principle of compound interest; the other is a simple method in which simple interest is used.

Selection of Treatable Timber

Structural Timber.—The fundamental requirements of structural timbers for treatment are strength and capacity for treatment to an extent which will insure protection against decay on all exposed surfaces. A penetration of ½ in. on the heart faces may be recommended as a safe minimum on structures above ground, although with a few resistant woods as good a treatment as can be expected will show less than ½ in. penetration in the heart. Where strength is required, not only the defects which might reduce the strength, but also the quality as determined by density should be specified; but where strength is not an essential only the soundness of the timber and the sapwood requirements as determining penetrability need be considered.

The specifications governing restrictions on knots, shakes, checks and cross grain, and also on density and the rate of growth of Southern yellow pine, which were adopted by the Southern Pine Association during 1915, should apply to all structural timbers where strength is a prerequisite. Since, for a given species, sapwood of equal moisture content and density is as strong as heartwood, sapwood restrictions need only be considered in relation to the efficiency of treatment. With red oaks, hemlocks and spruces no consideration need be given to sapwood restrictions. With the pines and Douglas fir, however, the amount and distribution of sapwood is of much importance. For other restrictions it is recommended that the specifications of the American Railway Engineering Association, as given on pages 231-234, inclusive, of the 1915 edition of its Manual, be adopted.

Track Ties.—The mechanical properties of timber in relation to the requirements of service conditions and its permeability by the preservative must be considered in selecting species. The sorting of timbers before treatment is progress in the right direction. It is preferable to treat in each cylinder charge one species of timber.

Piles.—The selection and purchase of piles for treatment should take into consideration their ultimate use, whether in salt or fresh water, for land foundation or marine work, and particularly whether subject to marine borers. The sapwood requirements, especially when the heartwood is resistant to treatment, should be based directly on service considerations. The following sapwood restrictions are based on the classification of the character of service for which the pile is to be used:

Specify not less than 2½ in. of sapwood, nor more than 5 in. for piles for use in salt water where the ravages of marine borers are extremely severe. Specify not less than 1 in. of sapwood, nor more than 3 in. for piles for use in salt water where the ravages of marine borers are less severe than in the group above. No sapwood restrictions are necessary for piles for use in fresh water or foundation work on land.

For the present the specifications of the American Railway Engineering Association (1915 Manual, pages 235-236) may be followed as to dimensions and defects of piles.

Preparation of Timber for Treatment

Adjust the methods of piling ties and lumber for seasoning to the local climate conditions, so as to obtain the maximum rapidity in seasoning without undue checking or warping. Support all piles on treated sill ties, and in all cases at least 6 in. of air space should be allowed underneath. To allow proper air circulation, the alleys between the piles should extend in continuous lines across the seasoning yard and should be not less than 3 ft. in the working spaces and 1 ft. in other directions.

In a moist climate and under humid conditions, season all material in open piles, which will provide free circulation of air and exposure to the sun. By open piles is meant the common 1x7, 1x8 or 7x2 piling system, or other arrangement which gives a minimum contact and the maximum of open spaces between the ties. Insist that the stringers be placed as near the end of the ties as possible, then in case of any defects from contact they will not fall upon the rail bearing. In arid climates with low humidity, season in close piles to prevent checking and warping.

Practically all woods can be air seasoned except in low humid locations. Gum is an exception, unless air seasoned under favorable conditions. Both gum and beech should be seasoned only in wide open piles and watched very carefully for decay. Bluing of sap pine during seasoning is not necessarily an indication of decay; it should be watched very closely, however, for the brown blotches, which are indications.

Ties and timbers which have a tendency to check should be protected with "S" irons, or other devices. These should be applied in the seasoning yard to all sticks showing serious initial checks in order to prevent further checking during or after treatment. Red oak and beech should be watched closely in this regard. All ties should be bored and adzed before treatment; this insures a uniform bearing surface and maximum penetration at the rail seat. All timbers should be framed before treatment; this provents any exposure of untreated surface where decay would first start.

Oak ties should be given a minimum of eight months seasoning, and should preferably be seasoned 12 months; yellow pine if seasoned in the south, 3 to 6 months; hemlock, tamarack and jack pine 12 months; gum, beech,

birch and hard maple from 4 to 6 months. Winter cut beech is preferable to summer cut.

All efficient plants should be equipped to steam material which occasion requires. The best method of introducing and distributing steam in the retort or cylinder is by means of perforated pipes. In steaming the pressure should at no time exceed 20 lb. per sq. in., nor the oil temperature in boiling exceed 200 deg. F. with possible exceptions in the case of some Pacific Coast timbers which may require higher temperatures.

Treatment of Timber

The full-cell treatment under the name of the Bethell process has been used extensively for years. It is essentially the impregnation of wood with practically all of the creosote it will hold, thereby giving the maximum protection. For many purposes this treatment is too expensive, and the committee therefore recommends the use of the full-cell process for piles and other marine timbers where subject to attack of the teredo and other marine borers, and that in such situations an injection of at least 20 lb. per cu. ft., or treatment to practical refusal, should be given; while in marine and land situations where decay is the principal source of failure, treatments may range down from 20 to 10 lb. per cu. ft. by the same process, the injection in all cases to be sufficient to penetrate all the sapwood. It further recommends the full-cell treatment in permanent structures not subject to mechanical wear when conditions of moisture, climate or humidity are favorable to wood-destroying fungi.

Empty-cell treatment with creosote aims to reduce materially the final retention of creosote per cubic foot, giving at the same time depth of penetration. The committee finds the empty-cell treatment suitable for all pine and other easily treated cross-ties used in moist climates, under service conditions which give a mechanical life in keeping with the anticipated life from decay; also for structures of limited life, or subject to superficial mechanical wear, and elevated so as to be exposed mainly to the wood-destroying influences of weather conditions.

In all outside situations it is recommended that a maximum injection of creosote, or sufficient to insure the penetration of all treatable wood, be required and that not less than an average of 5 lb. of creosote per cu. ft. be left in the treatable portions of the wood; while it is urged as a definitely specified requirement, that at least all of the sapwood and as much of the heartwood as is possible for the particular species shall be thoroughly impregnated, and the depth or extent of the penetration be equal to that of the full-cell treatment.

The committee recommends where zinc chloride alone is used, the treatment be by the processes known as Burnettizing, and that a full impregnation which will insure the retention of a minimum of ½ lb. of dry salt per cu. ft. of timber be given. It suggests zinc chloride treatment in arid and semi-arid regions, particularly for cross-ties and other material with mechanical life limited to the expectation of life from decay and checking. It should not be used where mechanical wear is eliminated, nor in situations where the treated timber is permanent or intermittent contact with either stagnant or flowing water.

Creosote-zinc in mixture is fundamentally effective because composed of the two most widely accepted preservatives. In situations where the mixture is preferable to a single preservative, it should be used according to the judgment of the consumer as to its greater economy and efficiency under local conditions.

A. R. Joyce, chairman (Joyce-Watkins Co.), J. B. Card (Central Creosoting Co.), O. P. M. Goss (Consulting Engineer, Seattle), F. R. Martin (C. & E. I.), Geo. E. Rex (A. T. & S. F.), Lowry Smith (N. P.), E. A. Sterling (National Lumber Manufacturers' Association), C. P. Winslow (Forest Products Laboratory).

Discussion

M. T. Shanesey (N. Y. C.) urged greater care in piling and holding ties awaiting inspection, and acceptance by the railroads and shipment to the treating plant. He particularly opposed the piling of ties on end, stating that some roads have already refused to accept ties so piled, while others have indicated their intention of doing likewise.

J. W. Roland (B. & O.) reported that he had encountered much trouble from this same cause because of the impossibility of inspecting the end of the tie on the ground, which may be in mud and exposed to early decay. He advocated piling them in ricks or square piles, so that an inspector can see both ends.

F. S. Pooler (C. M. & St. P.) stated that he does not accept any ties piled on end or in ricks. This provision is included in the specifications and all trouble is avoided.

OTHER REPORTS

A report on Terminology was presented which contained definitions of terms used in plant equipment and operation and also descriptions of the processes employed for the treatment of timber in the United States. A report on Plant Operation discussed the methods of measuring the quantities of preservatives used, the methods of determining the volume in a charge of ties, poles or piles, the importance of plant records and means for the control of fuel consumption. A detailed report was presented on Preservatives which contain methods of analysis of and specifications for zinc chloride and creosote and detailed information regarding the method of conducting tests.

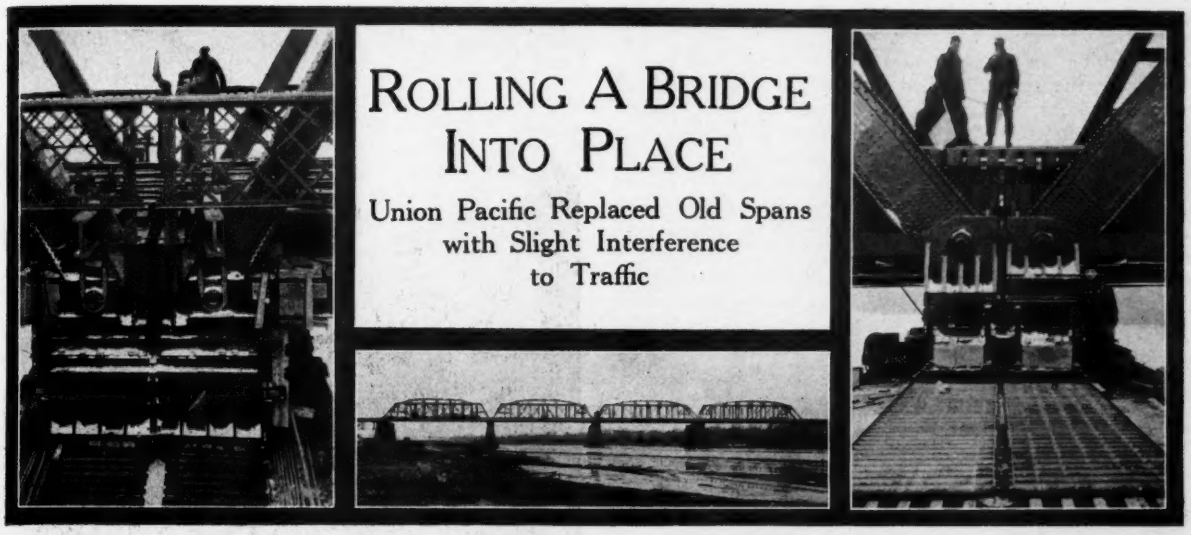
Reports were also presented on Wood Block Paving for street work and on Publicity, Promotion and Education. The latter report emphasized the importance of compiling and making available for general distribution, information concerning treated timber and its advantages.

J. H. Waterman, superintendent of timber preservation, Chicago, Burlington & Quincy, gave a talk entitled The Bad and the Good in the Handling of Wood, illustrated by slides and moving pictures. He pointed out defective practices in storing and handling ties which lead to their early failure, and then illustrated ways to avoid or correct such practices. He concluded his lecture with a moving picture film of the Galesburg, Ill., timber treating plant of the Burlington.

Geo. Rex, manager of treating plants of the Atchison, Topeka & Santa Fe, then presented a number of illustrations of defective methods in using treated timber and urged that those engaged in this industry pay more attention to this phase of the problem.

CLOSING BUSINESS

At the closing session on Thursday the following officers were elected for the ensuing year: President, John Foley, forester Pennsylvania Railroad, Philadelphia, Pa.; first vice-president, M. K. Trumbull, vice-president National Lumber & Creosoting Company, Kansas City, Mo.; second vice-president, J. B. Card, president Central Creosoting Company, Chicago, Ill.; secretary-treasurer, F. J. Angier, superintendent of timber treating plants, Baltimore & Ohio, Baltimore, Md.; members of executive committee, O. K. Hendricks, assistant chief engineer St. Louis & San Francisco, St. Louis, Mo., and C. M. Taylor, superintendent Port Reading Creosoting Works, Port Reading, N. J. It was voted to hold the next annual meeting at Chicago. The annual dinner was held at the Hotel Astor, on Wednesday evening.



ROLLING A BRIDGE INTO PLACE

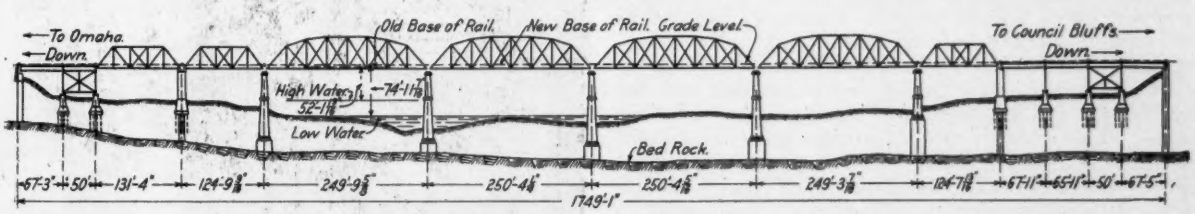
Union Pacific Replaced Old Spans with Slight Interference to Traffic

Rolling Rig for Old Spans

Rolling Rig for New Spans

THE renewal of four spans of the double track bridge of the Union Pacific over the Missouri river at Omaha, Neb., was accomplished, on December 23, 1916, by rolling the old spans transversely onto pile pier extensions at one side and shifting in new spans which had been erected previously on falsework along the other side of the bridge. This method has been applied previously in other structures, but in this case the four spans have an aggregate length of 1,000 ft. and the new spans combined weigh 3,850 tons. In consequence this performance sets a new record both as to length and weight for this method of bridge renewal. The bridge carries a very heavy traffic, there being an average of 300 train movements per day.

The present reconstruction involves the complete renewal of the superstructure and the partial renewal of the substructure for the approaches. No change was necessary in the substructure for the river spans. The latter vary from 249 ft. 3 in. to 250 ft. 4 in., the total distance between end piers being about 1,000 ft. These spans have pin-connected curve chord Pratt trusses. The top chords and end posts are of typical box sections, laced on the lower side, while the bottom chords are made up of eye-bars in all panels, the trusses being pin-connected at all joints. To accord with modern practice and loading, the new floor is 2 ft. deeper than the old one, a difference which was necessarily made up entirely by raising the tracks across the bridge.



GENERAL ELEVATION OF THE BRIDGE AS REBUILT

FALSEWORK AND ERECTION DETAILS

On account of the heavy traffic it was imperative that the plan adopted for erection be the one which offered the least interference with the regular use of the structure. It was concluded that this would best be accomplished by erecting the new spans complete on falsework and timber pier extensions in a position parallel to the existing bridge on the downstream side and provide timber pier extensions for the upstream side of the structure, on which the old spans could be shifted out of the way as the completed new spans were moved into position on the piers.

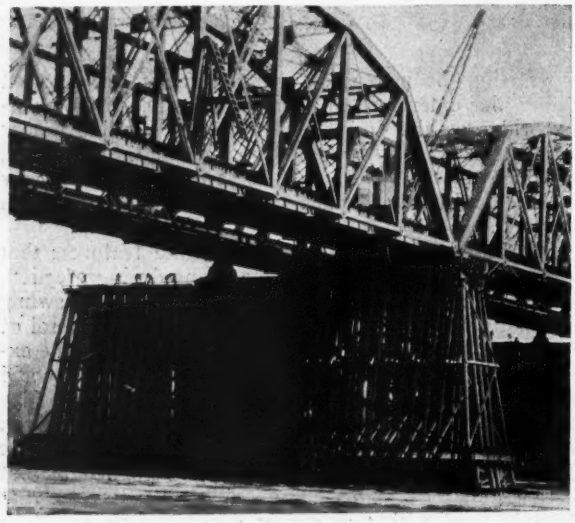
The falsework comprised two separate features: that necessary for the support of the spans during erection, which was removed as soon as the spans could be swung and that serving as temporary piers (shown in several of the accompanying photographs) built in line with the existing river piers on which the new and old spans could be supported when not in place upon the masonry. The falsework was made up of frame bents supported on pile bents which required piles 60 to 80 ft. long. The posts of the frame bents were of a single length, but were sash-braced, both longitudinally and transversely, at the mid level with two stories of cross bracing. The temporary piers each consists of five bents united to form rigid structures. As a means of insuring a thorough unity between each masonry pier and the temporary piers, the up and down stream piers were connected by cables and girts passing by each side of the masonry piers. The tops of the temporary structures were also built to the same level and top width as the stone piers.

All piles used in the falsework supporting the steel work were driven from two barge drivers by the bridge company. An approach trestle was built to provide access to the down-stream falsework from the main tracks at the east end of the bridge so that the equipment for the erection of the frame bents and the steel work could be set out from the main line.

The decision to use the erection method outlined above,

in advance of the steel fabrication, permitted the development of details in the end bearings for the superstructure which were especially adapted to the transverse rolling of the span and to the jacking necessary to release the rolling facilities after the shift had been completed. As seen in one of the accompanying photographs the cast steel shoes of the two trusses bearing on a single pier are supported on a grillage consisting of four girders parallel to the pier, continuous from truss to truss and extending some distance beyond on each side. The girders of each group are connected by diaphragms and batten plates to form a rigid unit construction and these are pierced at each end by horizontal pin holes by the aid of which jacking frames may be attached. The girders are of sufficient strength to support the span clear of the bearing when suspended from these jacking frames at each end. After the spans were placed in position on the masonry piers these grillages act simply as bearing shoes or bed plates.

As the need of lifting the old spans, to place the necessary rails and rollers under the shoes had not been anticipated in their design, the jacking up of the old spans

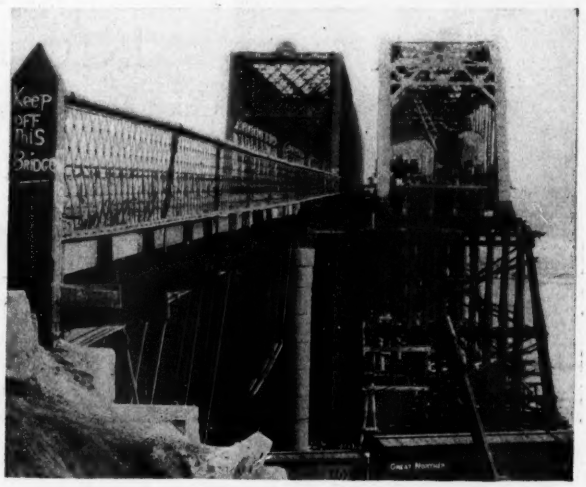


TEMPORARY PIERS

proved a rather difficult problem. It was accomplished by swinging the ends of the spans from U-bolts passing under the ends of the end pins, these U-bolts being suspended in turn from jacking beams crossing over the tops of the end bearings just inside of the end floor beams. This detail is also shown in one of the accompanying photographs. As the pins were short, special nuts or bushings had to be provided to receive the U-bolts. It was necessary to suspend the bearing castings by bolts attached to rails passing through the bearings.

The rollers as shown in the accompanying photographs were arranged in nests by means of bars to which they were secured at each end to insure perfect alinement. The loads of these spans were transmitted to these rollers through lines of rails, five for each set of rollers or ten for the top of each intermediate pier. The rails underneath the rollers were placed with heads up, while those between the rollers and the bridge bearings had the heads down. To facilitate the placing and removal of the rails they were arranged in three lengths with splices near each end of the permanent piers.

As the most important feature of the plan was the movement of the four spans of both the old and new superstructures as complete units, all details of the end bearings were arranged in a manner that would insure united action during the movement. At all expansion joints in both the new and the old structures the two



NEW MAIN SPANS ON TEMPORARY PIERS

bearings joining over the pier were clamped together so that longitudinal movement was temporarily eliminated.

THE MOVING EQUIPMENT

The movement was accomplished by means of 2-in. ropes reeved through four-sheave blocks into eight-part lines. One block of each set was attached to a snubbing

NEW SPANS SHOWING HOISTING ENGINES AND LINES

post at the upstream end of the temporary pier and the other block was secured to the end of the span. One complete set of these tackles was provided for each end of each of the spans. In the case of the old superstructure the blocks were lashed to the ends of the bottom chords, while in the new spans they were secured to pins at the ends of the bearing grillages. The 2-in. ropes from these tackles were run to hoisting engines standing on the new

spans, one engine being provided for each pier, or five in all. This plan necessitated four tackles from each intermediate pier and two at each of the end piers, but as the old and new spans were not moved simultaneously it was necessary to handle only two lines on the intermediate hoisting engines at a time. As shown in one of the accompanying photographs, the lines passed from the winch heads on the hoists to snatch blocks lashed to the portal bracing, thence down through the floor to other snatch blocks, and then out to the four-sheave blocks at the ends of the piers. This picture also shows that the engines were blocked up solidly from the track with struts to take up the reaction caused by the tension in the lines.

To insure control of the spans during the movement, a four-part wire cable hold-back line was provided at each pier to connect the spans with a timber anchored to the downstream end of each temporary pier. The line from this tackle, which was passed around the drum of the hoisting engine, was out-hauled while the movement was in progress and insured a measure of control by the use of the brake on the drum. To overcome starting friction, jacks were set up in horizontal or inclined positions against the ends of the spans to assist the hoisting engines to start the movement. As these jacks could not be set up readily a second time after the spans had moved some distance, it was necessary to start the spans by the use of the hoisting engines alone, following any intermediate stop in the movement. This was accomplished without difficulty.

To insure unity of action between the hoisting engines spread out over a distance of 1,000 ft. a carefully-planned system of signals was provided. A signal man with a red flag was stationed at each pier on the floor of the structure to be moved with two men at the center pier. A head signal man stood at the middle of the new structure in clear view of all the hoisting engines. Upon the striking of a gong all the signal men raised their flags and the engines were started simultaneously. Bridge men stationed on each pier observed the action of the rollers and bearings as the movement took place and in cases of any difficulty called to the signal man on the bridge floor overhead, who immediately dropped his flag. This signal was relayed to the center of the bridge, where the head signal man stopped all the engines by lowering his own flag.

The bridge was closed to traffic to make the change shortly after 11 a. m. At 11:25 the movement of the old superstructure was started and by 12 o'clock it was out on the falsework clear of the masonry piers. About 20 min. work was necessary to roll back the roller nests released from under the old spans, change the ropes on the hoisting engines, etc. With these changes made, the new span should have been in place in another 30 min. except for the unlooked-for failure of two of the hoisting engines because of foaming boiler water. After an ineffective effort to overcome this trouble the lines were shifted so that the two disabled hoists could be released and the lines from the two end piers run to the winch heads on two locomotive cranes which were stationed at the ends of the bridge. This change consumed considerable time, but the new spans were moved to final position by 4 p. m.

THE OLD SPANS CLEAR OF THE PIERS READY TO SHIFT IN THE NEW SPANS

Owing to the difference in the floor thicknesses of the old and new spans, the track on the latter, when moved into place, was approximately 2 ft. higher than the track on the adjoining approach spans. This difference was overcome partially by releasing the rollers and rails under the bearings of the outer ends of the two end spans, but principally by jacking up the adjoining ends of the approach spans. To reduce the delay to the traffic to a minimum no change was made immediately in the intermediate bearings of the new superstructure, as the rolling equipment was of ample strength to carry the train loading in addition to the dead weight of the bridge. For the release of the rollers and rails the spans were raised and lowered by means of 500-ton hydraulic jacks working on jacking frames at each end of the bearing grillages.

Track crews were held in readiness to close up the track as soon as the bridge ends were brought to grade and signal men bonded the joints so that automatic sig-

nals were restored to operation immediately, the rails for the entire length of the new spans having been bonded complete in advance of the change. Traffic was restored at 9:39 p. m. Every detail of the movement was carried out as planned and save for the unfortunate difficulty with the boiler water the closing unquestionably would have been completed according to schedule.

OLD SPANS TO BE USED AGAIN

The old spans had to be dismantled without the use of falsework by cantilevering from the new structure. The members will be removed by a traveler working from the top chords of the new bridge. After the removal of the floor system the upstream trusses will be taken down while supported from the downstream trusses and the new bridge. Then the downstream truss will be removed in a similar manner while supported from the upstream trusses of the new structure. As the old spans are in good condition, they will be supplied with a new single-track floor system and will be used elsewhere as single track spans of the same length as at present.

The design and construction of this bridge has been under the direction of E. E. Adams, consulting engineer of the Union Pacific System at New York City, and R. L. Huntley, chief engineer, and W. L. Brayton, bridge engineer of the Union Pacific at Omaha, Neb. The American Bridge Company is the contractor for both the fabrication and the erection.

B. & B. ASSOCIATION COMMITTEE APPOINTMENTS

THE following committee chairmen have been appointed by the American Railway Bridge and Building Association to investigate and report upon the subjects assigned to them for the next annual convention, which will be held in St. Paul, Minn., October 16 to 18, 1917:

The Construction of Shop Buildings, J. S. Robinson, division engineer, C. & N.-W., Chicago, Ill.

The Erection of Plate Girder Spans with the Least Interruption to Traffic, Lee Jutton, division engineer, C. & N.-W., Madison, Wis.

Roof Drainage of Railway Buildings, E. S. Meloy, assistant engineer, C. M. & St. P., Chicago.

Repairing and Strengthening Old Masonry, A. L. Gauthier, supervisor bridges and buildings, B. & M., Concord, N. H.

Hand-operated Devices for Lifting, Pulling and Hoisting, C. H. Fisk, consulting engineer, St. Louis, Mo.

Paint and Its Application to Railway Structures, Charles Ettinger, general paint foreman, I. C., Chicago, Ill.

Fireproofing Roofs of Wooden Buildings, J. B. Gaut, superintendent of bridges and buildings, G. T., Chicago, Ill.

Organization of the Water Service Department, Economical Delivery of Water to Locomotives, C. R. Knowles, superintendent of water service, Illinois Central, Chicago, Ill.

Blank Forms for Water Service Records, F. E. Weiss, chief clerk to chief enginer, C. M. & St. P., Chicago, Ill.

Snow Sheds, Geo. W. Rear, general inspector of bridges, S. P., San Francisco, Cal.

Efficient Methods of Handling Work and Men, Arthur Ridgway, assistant chief engineer, D. & R. G., Denver, Colo.

CO-OPERATE TO MOVE COAL.—Because of a coal famine the State Public Utilities Commission of Illinois called a conference of Chicago railway executives on January 18, for the purpose of considering means of expediting the movement of coal cars within the Chicago switching district. After suggestions had been offered by both the commission and the carriers, and assurances had been given by the roads that they would co-operate with the commission in any measures it chose to take in the matter, an order was entered, effective at 5 p. m., January 19, requiring that the railroads treat coal as a preferred class of freight, with priority of movement over all other traffic except food, live stock and perishables.

THE MATERIAL MARKET

ROADS having relaying rails for sale can now secure nearly as much for them as they cost originally. Scrap also is high compared with normal times, although the market has been unsteady during the last few weeks. There is a considerable variation in the prices for these items in different localities. For instance, rerolling rails bring $30 at Philadelphia, $25 at Pittsburgh, $27 at Chicago and $24.50 at Cincinnati. Relayers are quoted at $30 to $31 at Chicago, $27 to $28 at Cincinnati and $33 to $34 at St. Louis.

The most important activity of the month in the track supplies market was an order from the Southern Pacific for 94,000 kegs of spikes at 3.45 cents. This is said to be the largest purchase of this class of material on record. This road also bought 19,000 kegs of bolts at 4 cents, but this price is from one-half to three-quarters of a cent less than the prevailing quotations for this class of material. Boat spikes are quoted at Pittsburgh at $3.65 base price. Tie plates remain at $55 and $60 per net ton at the mill. Jobbers' price for wire nails at Pittsburgh is $3 per keg base price. The Chicago price is $3.189.

The past year produced a record in rail purchases. From reports now available it has been estimated that the orders placed for rail during 1916 exceeded 4,500,000 gross tons at an approximate value of $160,000,000. Foreign orders were large, but represented a relatively small proportion compared to domestic requirements. There has been little activity in the rail market in the last four weeks, and the most interesting development of the month was the formal withdrawal of the Pennsylvania's inquiry for 205,000 tons of rail. No reason was assigned for this action.

The structural shops received only a small tonnage of orders from the railroads in recent weeks. An indication of the tendency of prices in this particular field is to be obtained from an order for 20,000 tons of ship plates for a firm of Japanese ship builders, a part of which was priced at 6.25 cents. The shapes accompanying this order were quoted at four cents. With increasing delays in deliveries it becomes more and more difficult to name definite quotations for structural material, owing to the fact that the price named in any case depends upon the delivery stipulations. Warehouse stocks, of course, must be depended upon for any immediate deliveries. The stock prices at Chicago are 4.5 cents for plates and 3.85 cents for shapes.

While there has been a slight change in the price of cement in the East, the prices in the Middle West remain stationary, with $1.56 at Chicago, $1.66 at Pittsburgh, $1.79 at Cleveland, $1.73 at Indianapolis, and $1.83 at St. Paul and Minneapolis.

The Lumber Manufacturers Association estimates the production of lumber for 1916 at forty-two billion feet, an increase of only four billion over the output in 1915. This moderate increase in the production has been reflected in the prices, which have not advanced in like proportion with most other building materials. For this reason it does not cost much more to buy the material for a wooden structure now than it has at any time during the last two or three years. Deliveries, however, are giving considerable trouble because the production from a great many mills has been curtailed on account of the car shortage, which has been particularly severe in the larger lumber producing regions. Improvement with regard to this feature is now in sight, since recent reports by the American Railway Association show that the net car shortage was decreased from 114,908 cars to 59,892 cars during the month of December.

GENERAL NEWS DEPARTMENT

THE LEHIGH VALLEY has ordered 149 gasoline motor-driven cars for track-repair gangs. These will be added to the 183 cars now in use and retire the last of the hand-cars.

THE INTERSTATE COMMERCE COMMISSION opened the hearing in Washington, on January 29, on the tentative valuation reports of the Atlanta, Birmingham & Atlantic and the Texas Midland.

THE CANADIAN RAILWAY COMMISSION has authorized the Grand Trunk and the Canadian Pacific to curtail passenger service in order to provide engines and men for freight service, because the congestion of freight at the Niagara frontier has become so severe, and munitions must be moved.

THE ARKANSAS SUPREME COURT holds that a right-of-way deed to a railroad company does not fix the width of the right-of-way and that, therefore, the company's occupancy includes not only the land occupied by the track and by the pits from which earth was excavated for the embankment, but extends to the outer line of poles carrying a telegraph wire which is used in the operation of the railroad.

THE CANADIAN PACIFIC has opened its five-mile Connaught tunnel through the Selkirk mountains in British Columbia, for traffic. This marks the completion of the longest railway tunnel in the western hemisphere. In its construction a new record was set in tunnel-driving, and a novel and previously untried method being used, which involved the piercing of an auxiliary or pioneer heading entirely outside the tunnel proper.

THE STATE PUBLIC UTILITIES COMMISSION of Illinois issued an order on January 10 requiring that, beginning April 1, 1917, all flagmen at railway grade crossings shall use white disks, 16 in. in diameter, with the word "Stop" painted upon them in black letters. The order also requires crossing gates to be painted in black with white diagonal stripes. The above order is in accordance with the recommendations of the American Railway Association.

THE PRESIDENTS' CONFERENCE COMMITTEE on the federal valuation of the railroads has issued a statement indicating that up to November 30, 1916, the field inspection had been undertaken on roads with a total mileage of 135,988, that the roadway and track parties had inventoried 89,549 miles of line and that the railways have been further inventoried with respect to bridges on 64,210 miles of line, buildings 62,297 miles, signals 55,885 miles, telegraph and telephone 95,692 miles and land 31,002 miles.

THE KENTUCKY COURT OF APPEALS holds that a track walker, who knew that the sides and roof of a tunnel were not in any way supported, and that loose stone and dirt fell on the track, and that it might fall while he was walking through the tunnel, and who knew and fully appreciated the danger, assumed the risk of injury from the fall of stone and dirt, in the absence of any assurance that the place was reasonably safe in which to work, or that the dangerous condition would be remedied, and who voluntarily continued in his employment.

THE PENNSYLVANIA RAILROAD SYSTEM has carried 553,890,063 passengers a total distance of approximately 15,000,000,000 miles during the last three years without a single one being killed as a result of a train accident. During this time over 9,000,000 freight and passenger trains were operated over its 12,000 miles of line. During 1916 196,294,146 passengers were carried on the lines east and west of Pittsburgh without the loss of life of a single passenger in a train accident. This latter record was made while the heaviest freight traffic in its history was being handled.

THE CANADIAN RAILROADS are tearing up rails to furnish track materials for use in France, but they have only used tracks in yards and sidings on government lines so far. Operations on privately-owned roads will begin later. The scarcity of vessels limits the speed with which the work can be carried on, and it is estimated that not over 600 miles of track can be carried across the Atlantic within the time designated by the French government. The first shipment of 20 miles was made up mainly of surplus materials from the government lines. The rails now being loaded are mostly heavy sections, having come from tracks laid within the past five years.

THE UNITED STATES SUPREME COURT has arguments on the constitutionality of the Adamson eight-hour law on January 8, 9 and 10. The Government maintained in its argument that the law is within the authority conferred by the commerce clause of the Constitution and does not conflict with any limitations upon the part of Congress described in the Constitution. It claimed that the law is constitutional whether it limits the hours of labor or is merely a regulation of the wages of employees, although it contended that the law applies to hours rather than to wages. The railroad brief declared that the Adamson Law does not limit the hours of service to eight, but that the language shows that it deals solely with the construction of contracts and with the standards and amount of compensation without any limitation of the hours of labor. The judges manifested keen interest in the arguments regarding the power of Congress to regulate wages. Judge Pitney asked one of the attorneys for the Government whether in his opinion Congress could pass a law to require railroads to buy coal by the short ton of 2,000 lb. and pay for it at the price of a long ton of 2,240 lb. for nine months pending an investigation. Justice Brandeis asked whether the courts could take into consideration the increased cost of living, to which the attorney for the railways replied that in view of the high wages being paid to trainmen the cost of living was not of vital consideration. It is expected that the decision of the court will be handed down in February.

INCREASES IN PAY

The Nashville, Chattanooga & St. Louis has granted a 10 per cent increase in wages to section foremen and laborers, which will add $75,000 annually to the company's expenditure for track labor.

The Delaware, Lackawanna & Western plans to pay bonuses ranging from 6 to 10 per cent to employees whose pay is $2,000 or less yearly. About 7,000 employees will be benefited by this order.

The Southern Pacific adopted a plan similar to that of the Erie, whereby a bonus of 10 per cent of the annual pay will be paid to the employees, 5 per cent on January 1, 1917, and 5 per cent on July 1.

The Erie, on December 31, 1916, paid an extra month's wages to those of its employees not receiving more than $100 a month, excepting those working under contract and those who have been in the service less than two years. The number affected is about 10,000.

The Kansas City Southern, on December 1, made an increase of 10 per cent in the pay of employees receiving $50 a month or less and of $5 a month for those who received more than $50 and not more than $100, while men working by the hour will receive an increase of one cent an hour. The increase applies to all employees except those working under union contracts.

The Union Pacific has approved a plan, effective January 1, whereby every employee of the system who has been in the service of the company continuously for one year, and whose compensation does not exceed $4,000, will be provided with life, accident and sickness insurance at the expense of the company. The amount of each life insurance policy will be equal to one year's full wages, with a minimum payment of $500 and a maximum of $2,500. The accident insurance covers total and partial disability resulting from injuries in the performance of the employees' occupation, while the sickness insurance covers illness and injuries resulting from accidents not occurring in the performance of duty.

PERSONAL MENTION

GENERAL

H. H. TRABUE, assistant chief engineer and real estate agent of the Nashville, Chattanooga & St. Louis at Nashville, Tenn., has been appointed real estate agent, reporting directly to the president.

C. E. ERVIN, roadmaster of the Southern, with headquarters at Atlanta, Ga., has been promoted to superintendent of the Atlanta division of the Lines West, with same headquarters, succeeding E. E. Norris, promoted.

BENJAMIN MCKEEN, general manager of the Pennsylvania Lines, has been elected fifth vice-president. He was first employed as a rodman on the engineering corps of the Vandalia in 1886, and was engineer maintenance of way of the Logansport division of the Pennsylvania Lines from 1887 to 1894, when he entered the operating department. Since January 1, 1913, he has been general manager of the Pennsylvania Lines, with headquarters at Pittsburgh, Pa.

ROBERT CULIN WHITE, engineer maintenance of way of the Southern district of the Missouri Pacific, with headquarters at Little Rock, Ark., has been appointed superintendent of the Memphis division, with office at Wynne, Ark. He was born at Bertrand, Mo., on February 8, 1881. He attended the University of Missouri and later entered West Point, leaving the latter institution in June, 1905, to take employment with the Missouri Pacific. From February, 1907, to November, 1909, he was assistant engineer and roadmaster on the Eastern, Central Kansas and White river divisions of this same road, and from November, 1909, to April, 1914, he was assistant engineer, division engineer and general roadmaster on the Memphis, Central and Arkansas divisions of the Southern district. In April, 1914, he was appointed engineer maintenance of way of the Southern district, with office at Little Rock, Ark.

THOMAS B. HAMILTON, who has recently been elected resident vice-president of the Pittsburgh, Cincinnati, Chicago & St. Louis, with headquarters at St. Louis, graduated from Princeton University in 1888 and entered railway service on November 18, 1888, as a rodman on the Jeffersonville, Madison & Indianapolis Railway at Louisville, Ky. Since that time he has been employed continuously on the Pennsylvania Lines, advancing through the engineer corps to the position of assistant engineer of the Pittsburgh division on January 1, 1896, and engineer maintenance of way on the Toledo division on May 1, 1897. He was transferred to the Cleveland & Pittsburgh division on June 1, 1901. On December 21, 1903, he was appointed superintendent of the Erie & Ashtabula division, since which time he has been in the operating department, being general manager of the Vandalia at St. Louis at the time of his recent promotion.

ENGINEERING

S. D. BACON has been appointed division engineer of the Texas & Pacific, with headquarters at Marshall, Tex., succeeding H. P. Moberly, resigned.

F. VON SPRECKEN, first assistant engineer of the Atlantic Coast Line at Savannah, Ga., has been appointed division engineer, with headquarters at Waycross, Ga.

C. H. FORD has been appointed assistant engineer of the Dakota division of the Chicago, Rock Island & Pacific at Estherville, Iowa, succeeding W. E. Heimerdinger, transferred.

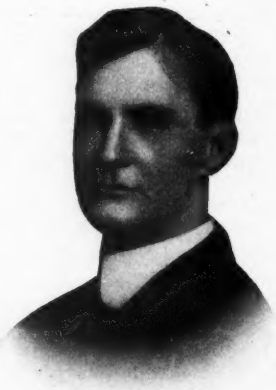
F. W. BAILEY, resident engineer of the Galveston, Houston & Henderson, with headquarters at Galveston, Tex., has resigned to accept a position as engineer maintenance of way with the San Antonio & Aransas Pass, with headquarters at Yoakum, Tex., which position has been vacant for some time.

B. HERMAN, chief engineer of maintenance of way and structures of the Southern Railway, with headquarters at Washington, D. C., has been appointed chief engineer, maintenance of way and structures of the Southern Railway, Lines East, with headquarters at Charlotte, N. C., effective January 17.

LOUIS YAGER, division engineer of the Northern Pacific on lines east of Mandan, N. D., has been appointed acting engineer maintenance of way of lines east of Paradise, Mont., with headquarters at St. Paul, Minn., vice Andrew Gibson, who has been granted a leave of absence on account of illness. Bernard Blum has been appointed acting division engineer of lines east of Mandan, succeeding Mr. Yager, effective January 1.

J. A. SCHUCH, announcement of whose promotion from assistant engineer to chief engineer of the Butte, Anaconda & Pacific, to succeed C. A. Lemmon, has previously been made in these columns, was born November 18, 1880, at Williams port, Pa. He graduated from Bucknell University in June, 1907. In September of that year he took employment with the Bessemer & Lake Erie, serving in the engineering corps as chainman, rodman and draftsman. In October, 1909, he left the above company and entered the service of the Chicago, Burlington & Quincy as a draftsman on the lines west of the Missouri river. He was connected with the Burlington until October, 1911, when he was appointed assistant engineer of the Butte, Anaconda & Pacific, the position he held when promoted to chief engineer, as noted above.

GEORGE F. BLACKIE, engineer of roadway and track of the Nashville, Chattanooga & St. Louis, has been appointed assistant chief engineer of the Nashville, Chattanooga & St Louis, with headquarters at Nashville, Tenn. He was born at Nashville, Tenn., on December 22, 1869, he was educated at Montgomery Bell Academy, and later studied engineering at Vanderbilt University, from which he graduated. In 1886 he began railway work as a rodman, and remained in that position until 1892, when he was made assistant engineer. Ten years later he was appointed principal assistant engineer of the Nashville, Chattanooga & St. Louis, and later in the same year was transferred to the general manager's office as engineer of roadway and track, with headquarters at Nashville, which position he held at the time of his recent appointment as assistant chief engineer, as noted above.



G. F. BLACKIE

R. S. CLAAR, assistant engineer of the Duluth, South Shore & Atlantic, announcement of whose appointment as office engineer, with headquarters at Duluth, Minn., was made in the January issue, was born October 24, 1887, at Blair, Neb. In September, 1906, he entered railway service with the Chicago & Northwestern as a clerk in the storekeeping department at Bonesteel, S. D., later being transferred to Chicago, Ill. From September, 1907, to September, 1908, he was employed in the office of the auditor of freight accounts of the Union Pacific at Omaha, Neb., and from September, 1908, to May, 1912, he attended Armour Institute of Technology, Chicago, Ill., from which he graduated on the latter date. From May, 1912, to August of the same year he was employed in the engineering department of the Chicago, Milwaukee & St. Paul as a designer and detailer, leaving this company at that time to accept a position with the Duluth, South Shore & Atlantic as a designer. In May, 1914, he was appointed assistant engineer in charge of permanent construction for this same company, with office at Duluth, Minn. He succeeds J. E. Bebb, resigned to accept service with another company.

ALBERT ARTHUR MILLER, general roadmaster of the St. Louis, Iron Mountain & Southern, with headquarters at Poplar Bluff, Mo., has been appointed district engineer maintenance of way at Little Rock, Ark., succeeding R. C. White, promoted. He was

born at Zanesville, Ohio, on September 28, 1879. He graduated from the Ohio State University in 1902 and immediately entered railway service with the Baltimore & Ohio as an assistant engineer on the Wheeling division, being later transferred to the Cleveland division. From June, 1903, to January, 1907, he was assistant engineer, under the direct supervision of the chief engineer of maintenance of way, with headquarters at Baltimore, Md., and from January, 1907, to September, he was division engineer on the Philadelphia division, with office at Philadelphia, Pa. In September, 1907, he was appointed chief engineer of the West Coast Company of Mexico, with headquarters at Los Angeles, Cal., which connection he held until June, 1909, when he was made assistant engineer in the office of the chief engineer maintenance of way of the Missouri Pacific at St. Louis, Mo. From December, 1910, to June, 1911, he was division engineer for this same road in general charge of its Kansas City terminal, and from June, 1911, to December, 1916, he was division engineer and general roadmaster of the Missouri division, with headquarters at Poplar Bluff.

ALBERT W. NEWTON, assistant to the president of the Chicago, Burlington & Quincy, has been appointed chief engineer, with headquarters at Chicago, succeeding T. E. Calvert, deceased, effective January 1. Mr. Newton was born at Jerseyville, Ill. He was engaged in general engineering practice from 1892 to 1898, and from 1898 to 1900 he was engineer of the Sny Island levee and drainage district, with headquarters at Pittsfield, Ill. His first railroad experience was with the Chicago & Alton from 1900 to 1903, during its reconstruction period. Mr. Newton was employed as assistant engineer, with headquarters first at Kansas City, Mo., and later at Bloomington, Ill. On March 15, 1903, he first entered the service of the Chicago, Burlington & Quincy as construction engineer at St. Louis, Mo., in charge of the old Monroe, Mo., to Mexico extension. On October 1, 1904, he was appointed assistant engineer, with office at Chicago, and on December 1 of the same year returned to St. Louis as engineer of the Missouri district. On January 1, 1907, he became general inspector of permanent way and structures in the office of the vice-president, with headquarters at Chicago. On January 1, 1915, he was appointed assistant to the president, with headquarters at Chicago, and continued in that position up to the time of his recent appointment as chief engineer.

A. W. NEWTON

SAM J. MAAS, office engineer in the valuation department of the Missouri, Kansas & Texas, with headquarters at Parsons, Kan., has resigned to become resident engineer of the Galveston, Houston & Henderson, with office at Galveston, Tex. He was born in Texas in 1881 and graduated from the University of Texas in 1905. Several months later he entered the service of the Illinois Traction System as a draftsman, and the following year was assigned to new construction work for this same company. In 1907 he was employed by the Galveston Grade Raising Committee in a consulting capacity and was appointed city engineer of Galveston, Tex., in 1908. In 1909 he became connected with the North American Dredging Company, engaged in new railway work in Honduras. From 1910 to 1914 he was assistant engineer on the Galveston, Houston & Henderson, and then took a position in the valuation department of the Gulf, Colorado & Santa Fe. In 1915 he was connected with the Cleveland, Akron & Canton Terminal Company, and in 1916 he was employed in the valuation department of the Missouri, Kansas & Texas as assistant office engineer. His present appointment, as noted above, became effective December 15, 1916. He succeeded F. W. Bailey, resigned to accept service with another company.

TRACK

JOSEPH COLLES has been appointed roadmaster of the Chicago, Rock Island & Pacific, with headquarters at Dows, Iowa, succeeding J. R. Hayes, transferred.

E. C. REID, supervisor on the Alabama, Tennessee & Northern, was appointed roadmaster of the Northern district, extending from York, Ala., to Reform, with headquarters at York, succeeding L. B. Hancock, resigned, effective December 25.

A. L. FERGUS, assistant engineer, Nashville, Chattanooga & St. Louis, has been appointed track supervisor on the Chattanooga division, in charge of track between Nashville and Decherd, succeeding J. T. Hill, assigned to other duties.

DANIEL S. BAILEY, supervisor of the Illinois Central, with headquarters at Rantoul, Ill., has retired on a pension and has been succeeded by Michael Sheehan, supervisor at Springfield, Ill. Peter Cheek, extra gang foreman, was appointed supervisor, with office at Springfield, Ill., succeeding Michael Sheehan, transferred.

E. C. BUHRER, supervisor of the Zanesville & Western, with headquarters at Fultonham, Ohio, has been appointed supervisor on the Toledo & Ohio Central, with headquarters at Kenton, Ohio, succeeding M. Emfield, resigned. J. E. Temple, yard foreman, has been promoted to the position of supervisor, succeeding Mr. Buhrer.

J. M. HAMMAN, supervisor of the Long Island, has been transferred to division 3, with office at Jamaica, succeeding M. S. Powell, resigned. Mr. Hamman has been succeeded by W. M. Speers, assistant supervisor, as noted elsewhere, and R. L. Haring has been appointed assistant supervisor of division 3, with office at Jamaica, succeeding Mr. Speers.

F. E. TRIECHMAN, roadmaster on the Lansing division of the New York Central, with headquarters at Hillsdale, Mich., has been transferred to the Fort Wayne division, with headquarters at Hillsdale, Mich, succeeding G. C. McMillen, Jr., who has been transferred to the Danville division, with headquarters at Gibson, Ind., succeeding Oscar Johnson, deceased.

DAVID PETERS, extra gang foreman of the Illinois Central, the announcement of whose appointment as supervisor, with office at Freeport, Ill., was made in the December issue of this journal, was born December 1, 1876, at Burlington, Ill. After leaving school he entered the service of the Illinois Central as a section laborer in 1900. In 1904 he was appointed extra gang foreman, in which capacity he served up to the time his present appointment became effective.

HENRY H. BRITTON, general foreman on the Air Line division of the New York Central, has been appointed roadmaster of the Lansing division, with office at Hillsdale, Mich. He was born in Hillsdale County, Mich., on May 3, 1879. He entered railway service in April 1897, with the Lake Shore & Michigan Southern as a section laborer, and was appointed section foreman in October, 1901. From April, 1907, to April, 1912, he was extra gang foreman, and from April, 1912, to December, 1916, he was general foreman, holding this latter connection at the time his present appointment became effective.

R. H. MILLIKIN, the announcement of whose appointment as roadmaster on the Canadian Pacific, at Orangeville, Ont., was made in a recent issue, entered the service of the Canadian Pacific as a section laborer at Guelph Junction in March, 1906. In January of the following year he was promoted to section foreman at Wallenstein, being transferred later in the same capacity to Woodstock, Dumfries and Streetville Junction. In May, 1911, he was made extra gang foreman, and in 1912 he was made general foreman, in charge of extra gangs and assisting the roadmaster, until the time of his recent promotion.

JOSHUA B. ALLEY, the announcement of whose appointment as roadmaster of the Clinch Valley district of the Norfolk & Western, with headquarters at Bluefield, W. Va., was made in the January issue, was born at Red Shows, N. C., on March 31, 1884. He entered railway service with the Norfolk & Western as a section laborer on January 1, 1902, and was promoted to assistant section foreman in March, 1906. In February, 1907, he was appointed section foreman in the yards at Bluefield, W. Va., which position he held at the time of his present advancement.

E. B. FITHIAN, general roadmaster of the Arkansas division, of the St. Louis, Iron Mountain & Southern, with headquarters at Little Rock, Ark., has been appointed general roadmaster of the Missouri division, and will have his headquarters at Poplar Bluff, Mo., succeeding A. A. Miller, promoted to engineer maintenance of way, Southern district. J. H. McFadden, assistant engineer of the Arkansas division at Little Rock, Ark., has been appointed general roadmaster on that division, with the same headquarters, succeeding Mr. Fithian.

W. M. SPEERS, who was appointed track supervisor on the Long Island Railroad with headquarters at Hicksville, N. Y., effective December 1, 1916, entered the employ of the Long Island as a chainman in maintenance of way work in 1906 and has since been continuously in the service of that department. He served successively as rodman, levelman, draftsman and chief draftsman. In August, 1915, he was made acting supervisor with headquarters at Patchogue, and in December of the same year he was made assistant supervisor, with headquarters at Long Island City, which position he held at the time of his recent appointment.

J. A. MOORE was appointed roadmaster on the Southern district of the Alabama, Tennessee & Northern Railway, with jurisdiction over the track between Mobile, Ala., and York, and with headquarters at York, Ala., on January 1, 1917. He was appointed extra gang foreman of the Alabama & Vicksburg Railway in 1894, and subsequently has served successively in the same capacity on the Illinois Central, the St. Louis, Iron Mountain & Southern and again on the Alabama & Vicksburg. During the six years from 1906 to 1912, he served as supervisor on the Panama Railroad. From 1913 to 1916, he was again employed by the St. Louis, Iron Mountain & Southern as extra gang foreman, and from 1916 to 1917 was employed as supervisor of the Alabama, Tennessee & Northern.

BRIDGE

G. C. TUTHILL, assistant bridge engineer of the Michigan Central, with headquarters at Detroit, Mich., has been appointed acting bridge engineer, succeeding H. Ibsen, assigned to special work.

E. GEPHART, supervisor of bridges and buildings on the Eastern division of the Chicago & Alton, with headquarters at Bloomington, Ill., has been appointed general supervisor of bridges and buildings, with jurisdiction over the system, and with headquarters at the same point, effective January 1.

JOHN E. BEBB, assistant bridge engineer of the Michigan Central, with headquarters at Detroit, Mich., announcement of whose appointment was made in the last issue, was born at Cincinnati, Ohio, on February 12, 1883. He graduated from the University of Cincinnati in 1905 and entered railway service almost immediately with the Michigan Central as a draftsman, advancing successively through the grades of designer, bridge inspector and office engineer of the bridge department. In 1912 he was appointed office engineer of the Duluth, South Shore & Atlantic and the Mineral Range jointly, with headquarters at Duluth, Minn., which latter connection he held at the time his present appointment became effective, as noted above.

PURCHASING

R. M. NELSON has been appointed assistant purchasing agent of the Chesapeake & Ohio, with office at Richmond, Va.

ROY BENSON, chief clerk in the purchasing department of the Chicago & Western Indiana and the Belt Railway of Chicago, has been appointed purchasing agent, succeeding George L. Pollock, resigned to become vice-president and treasurer of the Burnside Steel Company, Chicago, Ill.

H. P. MCQUILKING, district storekeeper of the western lines of the Baltimore & Ohio, with headquarters at Cincinnati, Ohio, has been appointed chief clerk to the general storekeeper at Baltimore, succeeding A. R. Portlock, deceased. H. Shoemaker, district storekeeper of the West Virginia district, with headquarters at Wheeling, W. Va., has been appointed district storekeeper on the western lines at Cincinnati, Ohio, succeeding Mr. McQuilkin. W. C. Ware, special agent in the purchasing department, succeeds Mr. Shoemaker.

CONSTRUCTION NEWS

THE ATCHISON, TOPEKA & SANTA FE is making new surveys and retracing old lines from Hollyrood, Kan., west to Galatia, a distance of about 35 miles. The right-of-way is being acquired and construction work is expected to begin at once.

THE ATLANTIC COAST LINE plans soon to start work on a new passenger station at Norfolk, Va., and contract for the building has been let to the A. M. Walkup Company, Richmond, Va. Work is expected to be completed within four months.

THE BALTIMORE & OHIO has let a contract to Edward Brady & Sons, Baltimore, to build the superstructure on its pier at Locust Point, Baltimore, at an approximate cost of $450,000. This pier will be used by a proposed $15,000,000 South American line of steamships, and will be one of the largest on the Atlantic Coast.

This road has also secured the right of way for an extension of the tracks in the Curtis Bay section of Markley's Neck in Anne Arundel County, Md. The work will include the construction of a bridge over Curtis Creek and a line to connect industries along the shores. The company has also secured permission to extend its tracks from President Street, Baltimore, to the water front at Lancaster Street to connect at that point with floats carrying cars to and from the municipal tracks on Key Highway. A pier and three bridge floats will be constructed, and the car ferry formerly operated between Locust Point and President Street will be constructed.

THE CANADIAN PACIFIC has given a contract to the Deakin Construction Company, Montreal, Que., to construct a building to house employees at St. Andrews, N. B. The structure will be 32 ft. by 125 ft. and two stories high, of frame and stucco construction, and will cost about $25,000.

THE CHICAGO & ALTON will double-track its line from Kansas City, Mo., to Rock Creek, a distance of 10 miles, early in the spring. The approximate cost of this improvement is $25,000 per mile. While it is the general plan to double-track the entire division, nothing definite will be undertaken further during 1917.

THE DULUTH, MISSABE & NORTHERN has let a contract to the Barnett & Record Construction Company for the foundations for the new ore dock at Duluth, Minn. The new dock will be entirely of steel, with concrete foundations, and will have 384 pockets, each with a storage capacity of 350 tons of ore. It is expected to have the dock ready for use in the early fall. The approximate cost of this undertaking is estimated at $2,250,000.

THE ERIE has awarded a contract to the Warren Construction Company, Jamestown, N. Y., to build a new freight house at this point.

THE GREAT NORTHERN has awarded contracts to Westinghouse, Church, Kerr & Company, to erect additions to its machine shops at Superior, Wis. The contracts cover both the design and construction, though no definite plans have as yet been approved. The Grant-Smith Company have the contract to enlarge the machine shop at Great Falls, Mont., to twice its present capacity, at a cost of about $1,000,000. Later in the year it is expected that the shop facilities at St. Cloud, Minn., will be enlarged, but it is not known how extensive these improvements will be, nor what expenditure will be involved.

THE HUGO & OKLAHOMA is a new road which will run from Hugo, Okla., to Atoka, on the Atchison, Topeka & Santa Fe, a distance of 52 miles. Nearly all the right-of-way has been secured, and it is planned to begin actual construction early this year.

THE MISSOURI, KANSAS & TEXAS plans soon to construct a combination freight and passenger station at Lockhart, Tex., which will cost approximately $15,000. No contracts have as yet been awarded.

THE MISSOURI PACIFIC, the Union Pacific and the engineering department of Kansas City, Mo., are formulating plans to rebuild the James street viaduct and bridge connecting the city with

Kansas City, Kan., at an approximate cost of $125,000. It is not definitely known when bids will be called for.

THE NASHVILLE, CHATTANOOGA & ST. LOUIS plans to build 13 miles of railroad into the coal producing section of Grundy County, Tenn., and construction work will be started at once. The new line will be an extension of the Tracy City branch and will extend from the present terminus at Coalmont, Tenn., northeasterly to Mill Creek, near Tatesville. The preliminary survey for this extension was made over a year ago.

THE NORTHERN PACIFIC has awarded a contract to E. J. Rounds Construction Company, Seattle, Wash., to construct its new terminals at Hanford street and Occidental avenue, Seattle, and also to build a 22-stall frame roundhouse with concrete foundation, a wooden water tank, two standpipes, a score of small shop buildings and a two-track coal dock. The improvements will cost $150,000.

THE NORTH TEXAS & SANTA FE, a subsidiary of the Atchison, Topeka & Santa Fe, has awarded a contract to the L. J. Smith Construction Company, Kansas City, Mo., to build a line from Shattuck, Okla., to Spearman, Tex., a distance of about 90 miles.

THE OREGON-WASHINGTON RAILROAD & NAVIGATION COMPANY plans to spend between $3,000,000 and $4,000,000 during 1917 in reducing grades, rebuilding stations, installing sidings and reducing the curvature on its lines in Washington and Oregon.

THE OSAGE & SANTA FE, a subsidiary of the Atchison, Topeka & Santa Fe, has applied for a charter for a line to run from a point below Caney, Okla., through Pawhuska, to a connection with its line at Ralston, Okla., a distance of about 70 miles. The necessary right-of-way has already been furnished and actual construction will be started as soon as the charter is granted. The work will be done by contract, only the track and bridge material being furnished by the railroad.

THE PENNSYLVANIA RAILROAD has awarded a contract to W. H. Fissell & Company, New York, to build a two-story passenger station at Freeport, Pa. The structure will be 40 ft. by 113 ft., of rough-texture brick, with green tile roof and terra cotta trimmings, and will cost $50,000.

This road also plans to make improvements at Oil City, Pa., which will include the construction of a bridge over the Allegheny river to make a direct connection between the Buffalo division and the Salamanca branch and to provide a direct route through the city, the elevating of the tracks through the city, eliminating three grade crossings and the construction of a 15-span bridge over the river.

THE RICHMOND TERMINAL COMPANY will start work in March on a union passenger station at Richmond, Va., for the joint use of the Richmond, Fredericksburg & Potomac and the Atlantic Coast Line. The structure will be four stories high and will be built of Indiana limestone.

THE ROBY & NORTHERN will award contracts in April for the construction of an extension of its line from North Roby, Tex., to Sweetwater, a distance of 23 miles. It is estimated that there will be approximately 8,000 cu. yd. of excavation per mile; the maximum grade will be one per cent and the maximum curve three deg. The improvements also include four steel-and-concrete bridges averaging 1,200 ft. each, and a roundhouse and a machine shop at Sweetwater. The first section of the line, running from Roby to North Roby, a distance of 5 miles, and amounting to about 12 per cent of the entire work, has already been completed.

THE ST. PAUL UNION DEPOT COMPANY'S directors recently held a meeting in Chicago and agreed on the plans for the new headhouse, the track plan having been agreed upon some time ago. All of the roads have signed the operating agreement except the Chicago, Milwaukee & St. Paul and the Chicago Great Western, whose action awaits a vote by the directors, and the Chicago, Rock Island & Pacific, which must have the court's consent.

THE SOUTH PLAINS & SANTA FE, a subsidiary of the Atchison, Topeka & Santa Fe, has awarded a contract to John Scott & Co., St. Louis, Mo., to construct a line from Lubbock, Tex., to Brownfield, a distance of 65 miles. The A. T. & S. F. will furnish the track and bridge material and the contractors will supply all other materials and do all the necessary construction work.

THE TRANS-MISSISSIPPI TERMINAL plans soon to spend about $250,000 for a new train and classification yard at Westwego, La., which is about 9 miles north of New Orleans, and at which point it already has a small yard. The shops and roundhouse, now located at Gouldsboro, just across the river from New Orleans, will be reconstructed at the new yards, the roundhouse having 15 stalls. A new warehouse will also be added on the New Orleans side of the river.

THE UNION PACIFIC plans to make extensive improvements at Omaha, Neb., during 1917, which will include the construction of new shops, roundhouse facilities, coaling stations, etc., at a cost of $3,000,000. Plans for this work have not yet been completed except for a new power house and extensions to shops at Omaha, which will cost $656,000.

This road has also awarded contracts to the Phelan-Shirley Company, Omaha, Neb., to complete its double track from Archer, Wyo., to Pine Bluffs, a distance of 33.35 miles, and for two sections between Point of Rocks, Wyo., and Wamsutter, a distance of 51.89 miles. The Utah Construction Company, Salt Lake City, Utah, will complete the double track from Hermosa to Buford, 11.11 miles. The latter work includes the building of a tunnel about 1,800 ft. long adjacent to the present single-track tunnel, at a cost of $500,000. The total cost of all this double-track work, including the tunnel, will be about $4,120,000.

THE UTAH-IDAHO is now making surveys and will soon start construction on a steam line from Garland, Utah, to Bear River City, a distance of about 10 miles. The line will be built on the bank of an irrigation canal, and upon completion will be taken over by the Oregon Short Line.

THE WABASH is now receiving bids for the construction of a new combination depot at Huntington, Ind., to cost about $20,000.

THE YAZOO & MISSISSIPPI VALLEY has awarded a contract for the construction of a 300-ton coaling station at Baton Rouge to the Railroad Water and Coal Handling Company of Chicago. This station will serve four tracks and will be equipped with automatic coal handling machinery of the Holman type. It will be of timber construction with a concrete foundation.

STRUCTURAL STEEL

THE ATCHISON, TOPEKA & SANTA FE has purchased 126 tons of steel from the American Bridge Company, for one span of a bridge on the Topeka branch at Holliday, Kan.

THE ATLANTIC COAST LINE is receiving bids for 6,000 tons of steel for the construction of a bridge over the James river, near Richmond, Va.

THE NEW YORK, NEW HAVEN & HARTFORD has awarded a contract to the Strobel Steel Construction Company for 2,230 tons of structural steel for the strengthening of its bridge over the Hudson river at Poughkeepsie, N. Y.

THE NORTHERN PACIFIC has ordered 1,570 tons of structural steel from the American Bridge Company for several bridges.

TRACK MATERIALS

THE BESSEMER & LAKE ERIE has ordered 8,000 tons of rails from the Carnegie Steel Company.

THE DELAWARE, LACKAWANNA & WESTERN has ordered 25,000 tons of rails from the United States Steel Corporation and 10,000 tons from the Bethlehem Steel Company.

THE LOS ANGELES & SALT LAKE is in the market for about 200 miles of 90-lb. steel rails for the second half of 1917.

THE PITTSBURGH & LAKE ERIE has ordered 10,000 tons of rails from the Carnegie Steel Company.

THE SOUTHERN PACIFIC has ordered 54,800 tons of rails from the Tennessee Coal & Iron Company for 1918 delivery.

THE UNION PACIFIC has ordered 32,000 tons of rails from the Illinois Steel Company.

THE WHEELING & LAKE ERIE has contracted for 5,000 tons of 90-lb. open-hearth steel rails for 1918 delivery, together with the necessary splice bars.

SUPPLY TRADE NEWS

PERSONAL

E. P. HOBSON, formerly with the Sherwin-Williams Company, has been appointed railroad sales representative of the Barrett Company, with headquarters at Cleveland, Ohio.

W. E. KELLY, representing the Patton Paint Company of Milwaukee, Wis., has been appointed manager of railways sales, Chicago department, succeeding F. S. Hiland, resigned, effective February 1.

ARTHUR AIGELTINGER, vice-president of the Manganese Steel Rail Company, New York, has been elected president of the company, in place of W. G. Pearce, who has been elected chairman of the board.

R. W. YOUNG, secretary and general manager of the Weir & Craig Manufacturing Company, Chicago, Ill., has resigned to organize and become president of a new corporation, the R. W. Young Manufacturing Company, manufacturer of electric and pneumatic hoists, monorail cranes and electric and pneumatic turntable tractors. Mr. Young was born in Hamilton, Ont., and is a graduate of the Collegiate Institute of that city. In 1892 he went to Chicago to enter the firm of Russell Brothers & Young, iron founders, then being established. This concern carried on business for several years and then sold out, at which time Mr. Young became manager of the Liquid Carbonic Company at Pittsburgh, Pa. In 1902 he returned to Chicago to become secretary and general manager of the Weir & Craig Manufacturing Company, which position he held until his recent resignation.

R. W. YOUNG

WILLIAM A. FIELD, for the past 13 years general superintendent of the Illinois Steel Company, at South Chicago, Ill., has resigned, effective February 1, to become general manager of the United Alloy Steel Corporation, Canton, Ohio.

W. L. BATT has been made sales manager of the Hess-Bright Manufacturing Company, Philadelphia, and will have entire charge of its sales after February 1, 1917. Mr. Batt has been connected with this company for many years, doing much of the pioneer work which was necessary to develop the industry in this country.

ALEXANDER R. MCALPINE, special representative of Bird & Son, died at his home in Chicago on January 14. Mr. McAlpine was born at North Framingham, Mass., in 1850. When 20 years old he came west, entering railway service with the Bee Line, now a part of the Big Four. In 1885 he went to the Western Car Company as superintendent, remaining with them 15 years, when he went with the Burton Stock Car Company, and in February, 1902, he became connected with Bird & Son.

GENERAL

THE CALL SWITCH COMPANY, New York, at a special meeting of the board of directors, elected Harry A. Pike, assistant to the president, as a director and placed him in charge of sales, in addition to his other duties, to succeed R. V. Call, director and general manager, resigned.

THE UNITED STATES STEEL CORPORATION, at the close of business on December 31, 1916, had unfilled orders on its books amounting to 11,547,286 tons, the largest total ever recorded. This was an increase of 488,744 tons over the orders reported as unfilled a month previous, while the orders at present are over three times those at the same time two years ago.

THE GULICK-HENDERSON COMPANY, consulting and inspecting engineers and owning physical and chemical laboratories, announces the removal and consolidation of its general offices from 30 Church Street and 120 Broadway, New York City, to 13-21 Park Row.

J. LEONARD REPLOGLE, vice-president of the American Vanadium Company, has purchased the properties of the Wharton Steel Company, including two large and one small blast furnaces, the Wharton Northern Railroad and about 5,000 acres of ore land near Wharton, N. J. It is said that plans contemplating an outlay of $10,000,000 to $15,000,000 for steel mills is under consideration. In the meantime the three furnaces are undergoing repairs and will soon be placed in service.

THE CENTRAL CREOSOTING COMPANY, Chicago, has purchased the property of the Chicago Creosoting Company. The officers of the new company are: Chairman of the board of directors, S. H. Bingham, president American Tar Products Company; president, Joseph B. Card, president Indiana Zinc Creosoting Company; vice-president, E. J. Stocking, formerly sales manager, Chicago Creosoting Company; secretary, Wm. W. Thompson, Wm. W. Thompson & Co.; treasurer, Richard Tenwick.

THE INTERSTATE IRON & STEEL COMPANY, Chicago, recently has bought outright the entire property and business of the Grand Crossing Tack Company, Chicago. This purchase gives the Interstate Iron & Steel Company, in addition to its present works, an open-hearth steel plant and a blooming mill, as well as a complete line of nails, wire and wire products. Samuel Hale, formerly with the Wisconsin Steel Company, Chicago, and later general manager of the Algoma Steel Corporation, Sault Ste. Marie, Ont., becomes vice-president, in charge of the steel division. There will be no other change in the management, S. J. Llewellyn remaining as president and George F. Davie as vice-president and treasurer.

THE ATLAS PRESERVATIVE COMPANY OF AMERICA, INC., New York, announces a reorganization of the company whereby the weed-killing business will be continued according to the Atlas "A" method, under the name of the Chipman Chemical Engineering Company, Inc., beginning January 1, 1917. The staff of the company will be the same as that of the Atlas Preservative Company of America, Inc. R. N. Chipman, manager of the Atlas Preservative Company, will be president and general manager of the Chipman Chemical Engineering Company. The company's executive offices will, as heretofore, be at 95 Liberty street, New York. The factory will be at Bound Brook, N. J., and will have double the capacity of the present facilities of the company.

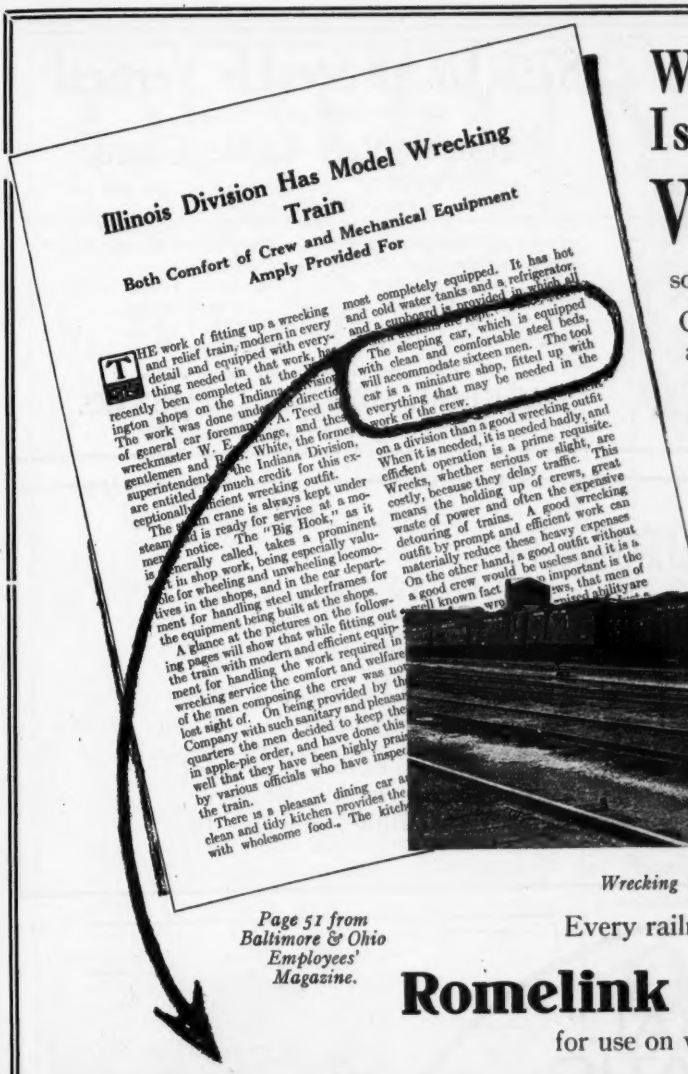
TRADE PUBLICATIONS

WOOD BLOCKS.—The Barber Asphalt Company, Philadelphia, Pa., has issued an 18-page booklet describing its Non-X-Ude wood block and illustrating its use in various kinds of service. The booklet contains specifications and information concerning the blocks and their uses.

THAWING OUTFITS.—The Hauck Manufacturing Company, Brooklyn, N. Y., has issued a pamphlet describing its kerosene thawing outfit and torches and illustrating its use on railroads, for such purposes as the thawing of track work, switches, signaling, hopper cars and the like. Several pages are devoted to detailed descriptions of the several sizes and types of burners made.

GUN-CRETE.—The Cement-Gun Construction Company, Chicago, has issued a 16-page booklet covering the composition of Gun-Crete, its application and the advantages of its use. The booklet is illustrated with photographs showing its use in structures for rust and fire protection, in dams for waterproofing and in repairs to old and defective structures of all descriptions.

ROOF VENT AND LEADER CONNECTIONS.—The Barrett Company, New York, has issued a 20-page booklet describing the "Holt" roof connections. It contains descriptions of five types of roof connections, with illustrations and detailed drawings of each device. It also contains a drainage table showing the size of leader outlets required for roof areas and for different slopes and roofing materials.



Illinois Division Has Model Wrecking Train

Both Comfort of Crew and Mechanical Equipment Amply Provided For

THE work of fitting up a wrecking and relief train, modern in every detail and equipped with everything needed in that work, has recently been completed at the ington shops on the Indiana The work was done under direction of general car foreman A. Teed and wreckmaster W. E. Hinge, and the gentlemen and [illegible] White, the former superintendent of the Indiana Division, are entitled to much credit for this exceptionally efficient wrecking outfit.

The steam crane is always kept under steam and is ready for service at a moment's notice. The "Big Hook," as it is generally called, takes a prominent part in shop work, being especially valuable for wheeling and unwheeling locomotives in the shops, and in the car department for handling steel underframes for the equipment being built at the shops.

A glance at the pictures on the following pages will show that while fitting out the train with modern and efficient equipment for handling the work required in wrecking service the comfort and welfare of the men composing the crew was not lost sight of. On being provided by the Company with such sanitary and pleasant quarters the men decided to keep them in apple-pie order, and have done this so well that they have been highly praised by various officials who have inspected the train.

There is a pleasant dining car attached clean and tidy kitchen provides the with wholesome food. The kitch

most completely equipped. It has hot and cold water tanks and a refrigerator; and a cupboard is provided in which all

The sleeping car, which is equipped with clean and comfortable steel beds, will accommodate sixteen men. The tool car is a miniature shop, fitted up with everything that may be needed in the work of the crew.

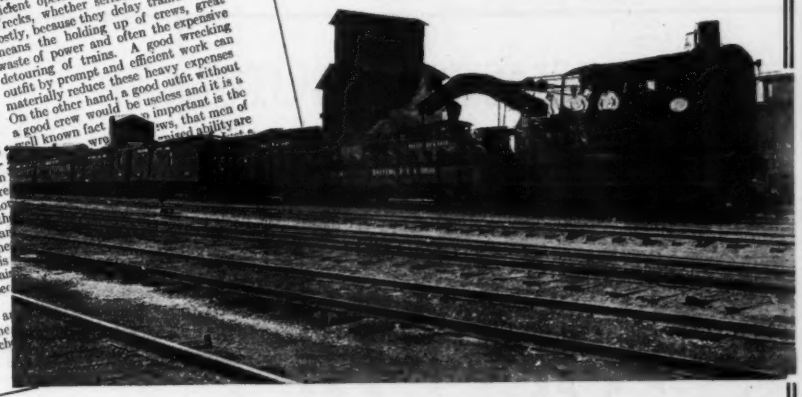
on a division than a good wrecking outfit. When it is needed, it is needed badly, and efficient operation is a prime requisite. Wrecks, whether serious or slight, are costly, because they delay traffic. This means the holding up of crews, great waste of power and often the expensive detouring of trains. A good wrecking outfit by prompt and efficient work can materially reduce these heavy expenses. On the other hand, a good outfit without a good crew would be useless and it is a well known fact [illegible] ews, that men of [illegible] ability are

Page 51 from Baltimore & Ohio Employees' Magazine.

Where Crew Comfort Is Vital!

WRECKS are costly, so costly in fact, that railroads are building up highly efficient wrecking crews so as to reduce these big expenses.

Clean, comfortable quarters, good food, and clean beds are absolutely essential if these crews are to be 100% efficient.

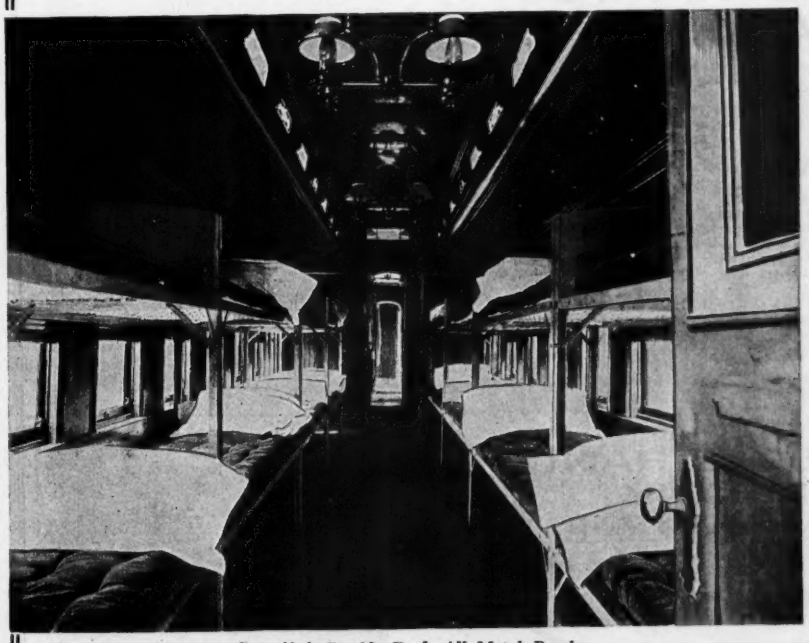


Wrecking Train of the Baltimore & Ohio.

Every railroad ought to investigate

Romelink All-Metal Bunks

for use on work and wrecking trains.



Romelink Double Deck All-Metal Bunks.

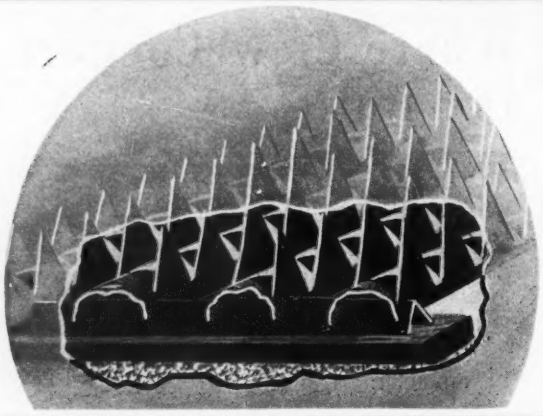
These bunks are all metal with rustless springs, easy to install, and easy to keep clean. There are no crevices for vermin to collect; in short, Romelink Double Deck Angle Bunks are sanitary in every respect. Besides, the springs are sagless and will sustain over 1400 pounds.

Let us take up with you the savings effected by using Romelink All-Metal Bunks; let us compare the cost with wooden bunks. Costs nothing to investigate—write.

Southern-Rome Co.

617-633 West Pratt St.

BALTIMORE, MD.



87% Of All Steel Is Vertical

IN THE NEW 1917 MODEL

National Steel Cattle Guard

This means no rain or salt water drippings can find lodgment. No danger of rust or corrosion. The new 1917 Model "National" is the ideal cattle guard for all steam and electric railroads. Now used by leading roads everywhere. Easily installed with unskilled labor. Either assembled or in independent strips. Maintained at a minimum cost—will last indefinitely.
The "National" is a MECHANICAL DEVICE that guarantees absolute protection against unruly stock.

Write for new descriptive circular—it's Free

NATIONAL SURFACE GUARD CO.

209 So. La Salle Street, Chicago, Ill.

EMPLOYMENT BUREAU

An employment and classified advertising section will be incorporated in this publication whenever there is a demand for such service.

Use this section when seeking a new man, a new position, or when buying or selling second-hand equipment.

Rate is 2c a word a month. Minimum charge $1.00. Remittance must accompany each order. Address Railway Maintenance Engineer, Classified Advertising Department, Transportation Bldg., Chicago, Ill.

"IMPERIAL" PNEUMATIC TIE TAMPERS

Enable you to reduce your ballasting costs to bed-rock level—whether for straight-away tamping or for terminal work.
On straight track tamping the observed comparative costs (N. Y. C. R. R.) of hand work and pneumatic tamping are $262.60 and $86.40 per mile—a saving of $196.20 in favor of "Imperial" Tampers.
In terminal work, the estimated cost of hand tamping a puzzle switch (C. & N. W. R. R.) was $20.00. "Imperial" Tampers did better work at a cost of $7.50.
"Imperial" Tie Tampers are equally effective in any sort of ballast material. They save time, reduce the labor needed and effect a more stable and better riding track. They eliminate the uneven tamping of an indifferent workman.
"Imperial" Pneumatic Tampers operate in pairs. The company furnishes gasoline driven portable compressors for operating two and four tampers and electrically driven units for operating two tampers. Where signal or switch air lines are permanently installed the tampers can be operated therefrom without interfering with the usual service.

If you are still tamping by hand you will be interested in the data in Bulletin 9023.

Ask for a copy.

INGERSOLL-RAND COMPANY

11 Broadway, New York

Offices the World Over

41-TT

Above an Imperial Compressor Outfit on the Lackawanna; below, Imperial Tampers operating from signal air line at the Pennsylvania Terminal.

QUALITY FIRST

What do the words "Creosote Oil" really mean?

The words "Creosote Oil" once signified and were universally accepted as describing a distillate of Coal Tar.

At the present time this once distinctive designation is applied to mixtures of Creosote and Tar, Creosote and Petroleum, Creosote and Asphalt and other compounds that are sold under the name "Creosote Oil."

No mixture possesses the permanent qualities of a pure, high-gravity, high-boiling point, stable Creosote Oil, and there is a wide variation in their preservative values.

To obtain the full mechanical life of Street Paving Blocks, Bridge Timbers and Bridge Floors, Telegraph and Telephone Poles, Cross-Arms, Piling and Cross-Ties the preservative must be pure, stable, of deep penetrance, insoluble in water and unaffected by extremes in temperature.

There is but one way to be sure of getting Creosote Oil of purity, stability, high specific gravity and high-boiling point that will be free from every kind of adulterant and that is by the adoption of specifications that will provide for

REILLY Improved

CREOSOTE OIL

The Most Effective Wood Preservative

FOR OPEN TANK AND BRUSH TREATMENT

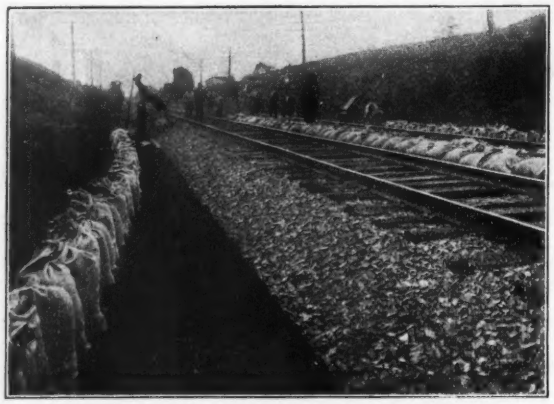
Reilly Improved Carbolineum is economical, effective and permanent.

REPUBLIC CREOSOTING COMPANY

Principal Offices: INDIANAPOLIS, IND.

PLANTS:

INDIANAPOLIS MOBILE MINNEAPOLIS SEATTLE



STONE BALLAST CLEANING

Can be done and is being done on some of the best railroads in the country at a saving of 56% by the use of the

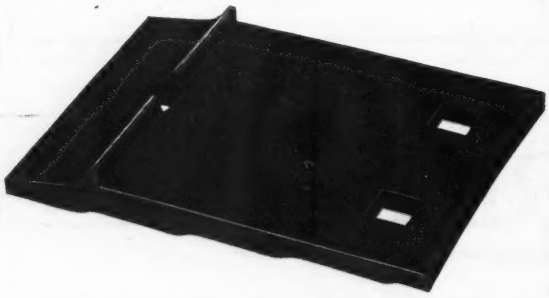
TRENCH-ZEPP STONE BALLAST CLEANER

Such economy well deserves your investigation.

Write for booklet of cuts and a copy of the latest report on Stone Ballast Cleaning by this new method.

LITTLEFORD BROS.

MANUFACTURERS CINCINNATI, OHIO SOLE AGENTS

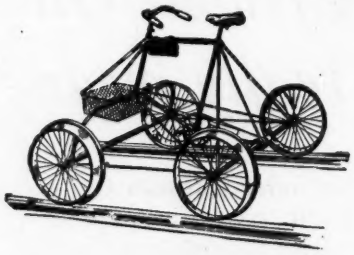


One of the most distinguished, successful and honored Engineers of the United States, while not wishing his name to appear in an advertisement, writes as follows of The

LUNDIE TIE PLATE

"It is by far the most scientifically designed and practically efficient tie plate ever evolved."

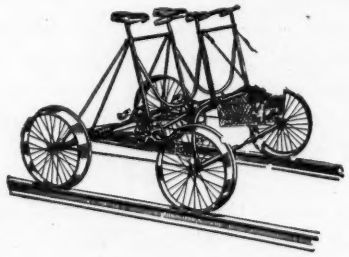
JOHN LUNDIE, 52 Broadway, NEW YORK



STRONG. LIGHT-RUNNING

Inspection Cars

are our specialty. We make them to fulfill any and all requirements and our success is attested by the repeat orders from roads that have given them a trial. Our new catalog contains full information and will be sent to you on request.

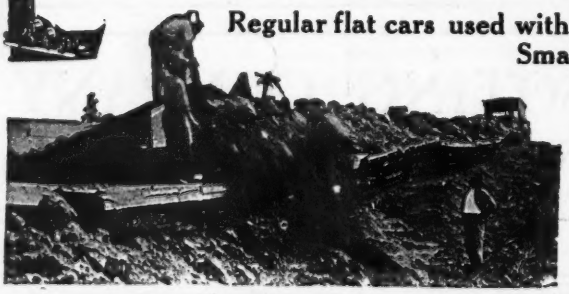


TEETER-HARTLEY MOTOR CO.

HAGERSTOWN, INDIANA

LIDGERWOOD RAPID UNLOADER

Regular flat cars used with this method, reducing dead weight haulage. Smaller crews required.



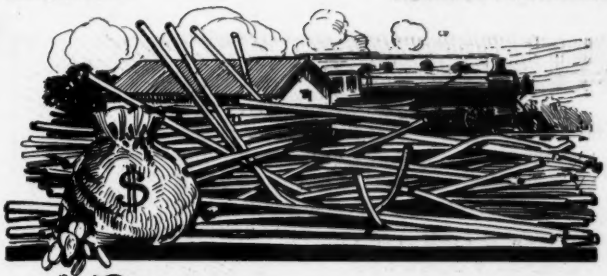
Load can all be dumped in one place.
Load can be spread along any distance.
Cars unloaded at lowest cost.

Send for Bulletin

Hoists for Every Railroad Service

Lidgerwood Mfg. Co. 96 Liberty Street **New York**

Philadelphia Pittsburgh Chicago Los Angeles Seattle



There Is Money In Your Discarded Boiler Flues

Get It Out—

—You Can Do It!

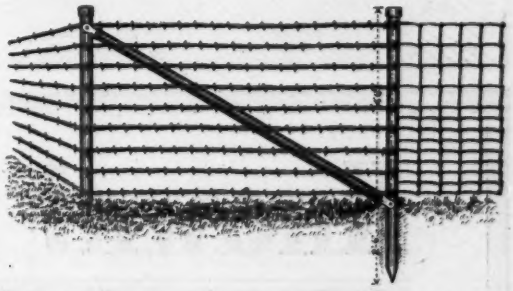
DID you ever consider the vast amount of money saved and made —"a penny saved is a penny earned"—through the utilization of material which a few years ago was considered as waste?

Consideration of this Matter

has meant "big money" for many a man, many a company.

Wise railroad management constantly looks toward greater earnings; knows that rightly directed utilization of its waste is an important factor in securing them.

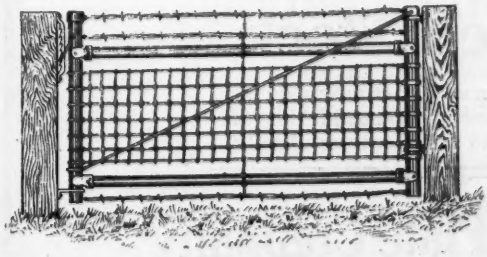
Discarded boiler flues, once considered as scrap, today, are being converted into fence posts, superior to any fence post on the market. You know those flues are of the best charcoal iron, you know that such material withstands the action of the elements better than carbon steel.



Then why buy fence posts instead of conserving your discarded boiler flues? Rattle those discards clean of scale and soot, ship them to us and we will use them to make fence posts and right-of-way gates, which give long service and defy fire and flood.

Send those discarded boiler flues to us, we will convert them into 6 ft. 6 in. fence posts, lugged with 18 staples punched out of the body to hold the wire securely, and cap them with a pressed steel cap. You can judge of the service secured from such posts, but have no idea how small the expense of securing them is.

Get all details now, learn how simple it is to get that money out of your discarded flues. Write us *now*, get the facts. Let us tell you about the Right-of-Way gate we make from old boiler flues. A gate which in durability, appearance, facility of action and economy has no equal.



The duty of a R. R. Purchasing Agent is to utilize everything possible and thus save his compamy undue expense. Here is your chance.

KANSAS CITY STEEL GATE FACTORY

19th and Grove Streets KANSAS CITY, MO.

CONCRETE CULVERTS

THE
BEST PIPE
FOR
RAILROAD CULVERTS
WHETHER FROM THE STANDPOINT OF
COST, INSTALLATION OR MAINTENANCE
IS

"QUALITY"  "ECONOMY"

REINFORCED CONCRETE
"STRENGTH OF CAST IRON AT ONE-THIRD THE COST"

CONCRETE PRODUCTS COMPANY OF PITTSBURGH
DIAMOND BANK BUILDING
PITTSBURGH, PA.

Known! KEYSTONE COPPER STEEL Proved!

In the retarding of corrosion, the remarkable influence of Copper when *properly alloyed* with steel has become a recognized and well-established fact.

KEYSTONE COPPER STEEL
Galvanized Culvert Stock

is better for both buyer and user. It is performance that proves quality. Apollo-Keystone is unequaled for Railway Culverts. Demand this material for Flumes, Tanks, Roofing, Etc. Send for Keystone Booklets.

American Sheet and Tin Plate Company
GENERAL OFFICES: Frick Building, PITTSBURGH, PA.

DISTRICT SALES OFFICES:
Chicago Cincinnati Denver Detroit New Orleans New York Philadelphia Pittsburgh St. Louis
Export Representatives: UNITED STATES STEEL PRODUCTS COMPANY, New York City
Pacific Coast Representatives: UNITED STATES STEEL PRODUCTS COMPANY, San Francisco, Los Angeles, Portland, Seattle

C. F. MASSEY COMPANY

NEW YORK CHICAGO SPOKANE

A three-span pile trestle using Massey Standard Slabs and Octagonal Piles. The use of Massey concrete piles and slabs reduces the expenses of handling to a minimum and does away with waste. This type of construction is being used by all leading railroads.

Massey products are permanent, fireproof, economical, and require absolutely no maintenance. They are made in modern well-equipped plants and of the best material procurable.

The advantageous location of our factories enables us to ship to all points at a low freight rate and the large stock of standard products carried at each factory insure prompt deliveries.

Information and prices on our piles, bridge slabs, cattle passes, culvert pipe and other products will be furnished interested parties on application.

Our Factories are Located as follows:	Newark, N. J.	Memphis, Tenn.	Kansas City, Mo.	Minneapolis, Minn.
	Chicago, Ill.	Anna, Ill.	Meridian, Miss.	Spokane, Wash.

Steel for Service

The following is an extract from a letter received from the South Indian Export Company:

"The 24-ft. Piles stood up to the work splendidly for the well which has just been completed, and we are now pulling them out for use in the gallery; they look like new. They have been buried for nearly a year. This is very interesting to us, and we have no doubt you will find it likewise."

United States Steel Sheet Piling

was used in this work. It can always be relied upon.

Ask for pamphlet—Steel Sheet Piling.

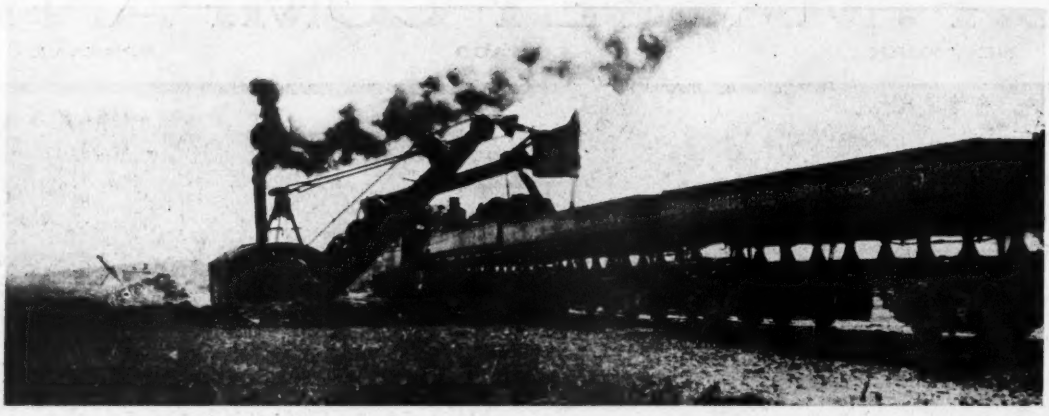
The mark of quality 

It protects the user

Carnegie Steel Company

General Offices—Pittsburgh, Pa.

835



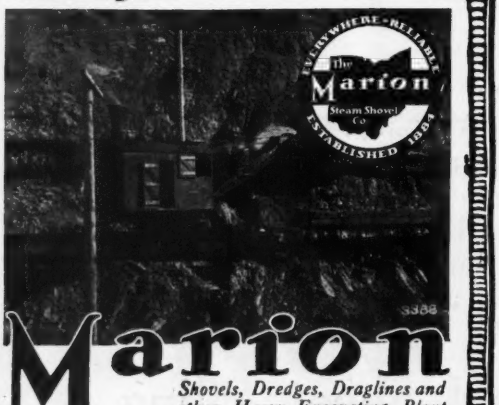
Western Air Dump Cars

are in use on all the Great Earth Moving Enterprises on the American Continent. Their records are well known on such jobs as the Panama Canal, the Lackawanna Cut-off, the Keokuk Dam, and scores of others of but little less importance. In all instances their performance has been the subject of much favorable comment.

Western Dump Cars have steel underframe and body frame and are built in accordance with M C B standards. They can be loaded to capacity, operated at high speed and dumped instantaneously either singly or together on straight track or curve. The only labor required for unloading is the operating of a valve in the cab by the engineer of the train.

We will gladly put you in touch with any or all of the forty-five big roads that are now using Western Air Dump Cars. Write us today.

WESTERN WHEELED SCRAPER CO., Aurora, Illinois



Marion

Shovels, Dredges, Draglines and other Heavy Excavating Plant

WHEN someone says "See America First" you immediately think of the Great Northern Railway; in just the same way do the officials of that famous system think "Marion" in connection with the terms "Ditching Machines," "Steam Shovels," or any kind of "Excavating Machinery."

For the Great Northern Railway and The Marion Steam Shovel Company are business friends in the strictest sense;—

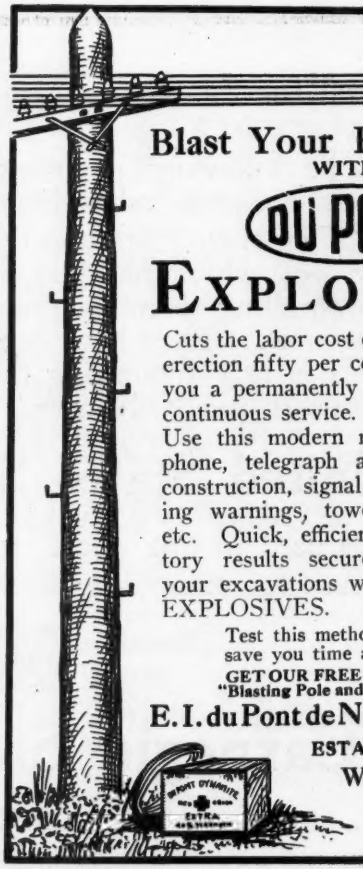
Marion Ditchers and Marion Shovels Do "Great Northern's" Big Work

and small work, too—whether it's constructing new lines or opening up ditches along existing rights-of-way.

May we suggest that an investigation might develop just as interesting possibilities for using "Marions" in your own work?

We should heartily welcome that, and will gladly assist you in making it. Your request for particulars will not obligate you.

THE MARION STEAM SHOVEL COMPANY
Established 1884 **MARION, OHIO**
Atlanta, Chicago, New York, Philadelphia,
225 San Francisco, Seattle



Blast Your Pole Holes WITH DU PONT EXPLOSIVES

Cuts the labor cost of pole and post erection fifty per cent, and insures you a permanently secure line and continuous service.

Use this modern method in telephone, telegraph and power line construction, signal systems, crossing warnings, tower foundations, etc. Quick, efficient and satisfactory results secured by blasting your excavations with DU PONT EXPLOSIVES.

Test this method. It will save you time and money.

GET OUR FREE BOOKLET: "Blasting Pole and Post Holes."

E. I. du Pont de Nemours & Co.
ESTABLISHED 1802
Wilmington, Delaware

Insuring Against Culvert Renewal Expense

Twenty-four inch National Lock-Joint Cast-Iron Pipe installed in fill 28 ft. high on the P. R. R. System.

Here are three views taken on the Pennsylvania's new line between Indianapolis and Frankfort, showing some big fills under construction, and more, showing how the Pennsylvania insures against culvert renewal expense by installing

National Lock-Joint Cast-Iron Pipe

Wood will rot, steel or refined iron rust, clay or earthenware disintegrate, but this culvert pipe, made from remelted Alabama Pig Iron, remains as permanent as your road bed. That is why over forty of the large trunk lines of this country *specify* and *insist* on National Lock-Joint Cast-Iron Pipe.

The Pipe of Short Units, Long Service and Low Costs

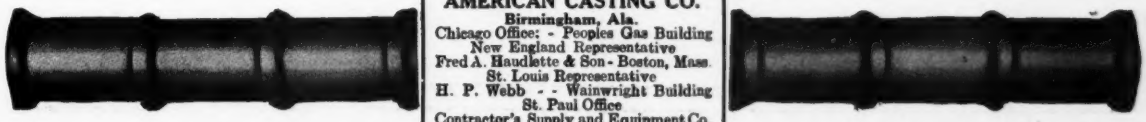
Forty-two inch National Lock-Joint Cast-Iron Culvert Pipe under a fill 45 feet high and 42 feet wide at the top, on the P. R. R. System.

The pipe which, due to its short units, permits easy handling, that can be installed by the ordinary section gang without accessory of any kind. The pipe with the joint that locks effectively, *prevents* separation, and *assures* alignment. The pipe that is sold by the foot, of low first cost, and which assures economy from the start and insures economy thru the years. Is it any wonder National Lock-Joint Cast-Iron Pipe is the standard of so many railroads, and that they look to it for

Installation of National Lock-Joint Cast-Iron Culvert Pipe under a fill 40 feet high and 38 feet wide at top, on the P. R. R. System.

Insuring Against Culvert Renewal Expense

CATALOGUE AND PRICES ON REQUEST



AMERICAN CASTING CO.
Birmingham, Ala.
Chicago Office: - Peoples Gas Building
New England Representative
Fred A. Haudlette & Son - Boston, Mass.
St. Louis Representative
H. P. Webb - - Wainwright Building
St. Paul Office
Contractor's Supply and Equipment Co.

Speaking of the

Railway Maintenance Engineer

H. R. Adams, Assistant Engineer of the Elgin, Joliet & Eastern Railway at Joliet, Ill., says:

> "The Railway Maintenance Engineer is, in my estimation, the most able, efficient and practical railroad maintenance man's paper that I have as yet read. I look to its arrival each month. It is not too technical, yet full of what a man needs in keeping up the road."

That is why the paid subscription list of the Railway Maintenance Engineer has grown from 4,012 in June, 1916, to 6,400 in January, 1917.

There is no other paper published anywhere in the world that is devoted entirely to railway maintenance department matters.

The subscription price to North America is only $1.00 a year.